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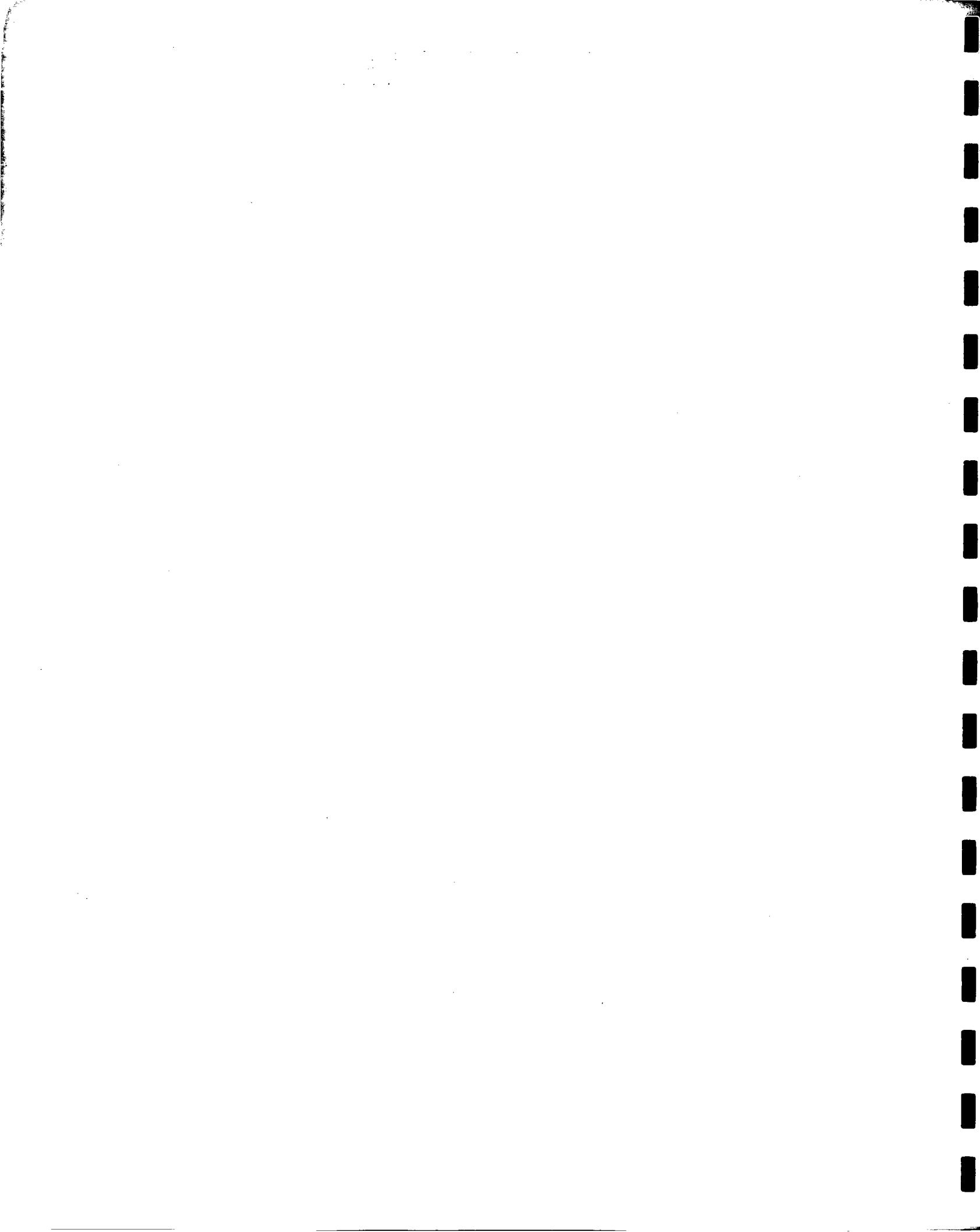
**BARKER LEMAR**  
ENGINEERING CONSULTANTS

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Doc # 31761

**2006 Annual Water Quality Report  
Carter Lake C & D Landfill (Closed)  
Carter Lake, Iowa**

*A WQ-16P*  
**Permit No. 78-SDP-02-80C  
Project No. ANDEX 06101  
November 2006**

**1801 Industrial Circle, West Des Moines, IA 50265  
(515) 256-8814 Fax (515) 256-0152**



**BARKER LEMAR**  
ENGINEERING CONSULTANTS

November 29, 2006

Amie Hart  
Iowa Department of Natural Resources  
Waste & Energy Management Bureau  
502 E. 9th Street  
Des Moines, IA 50319

**Re: 2006 Annual Water Quality Report  
Carter Lake C&D Landfill (Closed)  
Permit No. 78-SDP-02-80C  
Project No. ANDEX 06101**

Dear Ms. Hart:

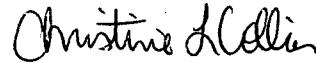
**BARKER LEMAR ENGINEERING CONSULTANTS (BARKER LEMAR)** has completed the water quality monitoring and assessment for the above-referenced site for the year 2006. Our services were performed in general accordance with Iowa Administrative Code (IAC) Section 114.26(4) and the current requirements for implementation of the Hydrologic Monitoring System Plan (HMSP). Please find enclosed a copy of the 2006 Annual Water Quality Report for the above-referenced site.

If you have any questions regarding this report, please contact us at (515) 256-8814.

Sincerely,  
**BARKER LEMAR ENGINEERING CONSULTANTS**

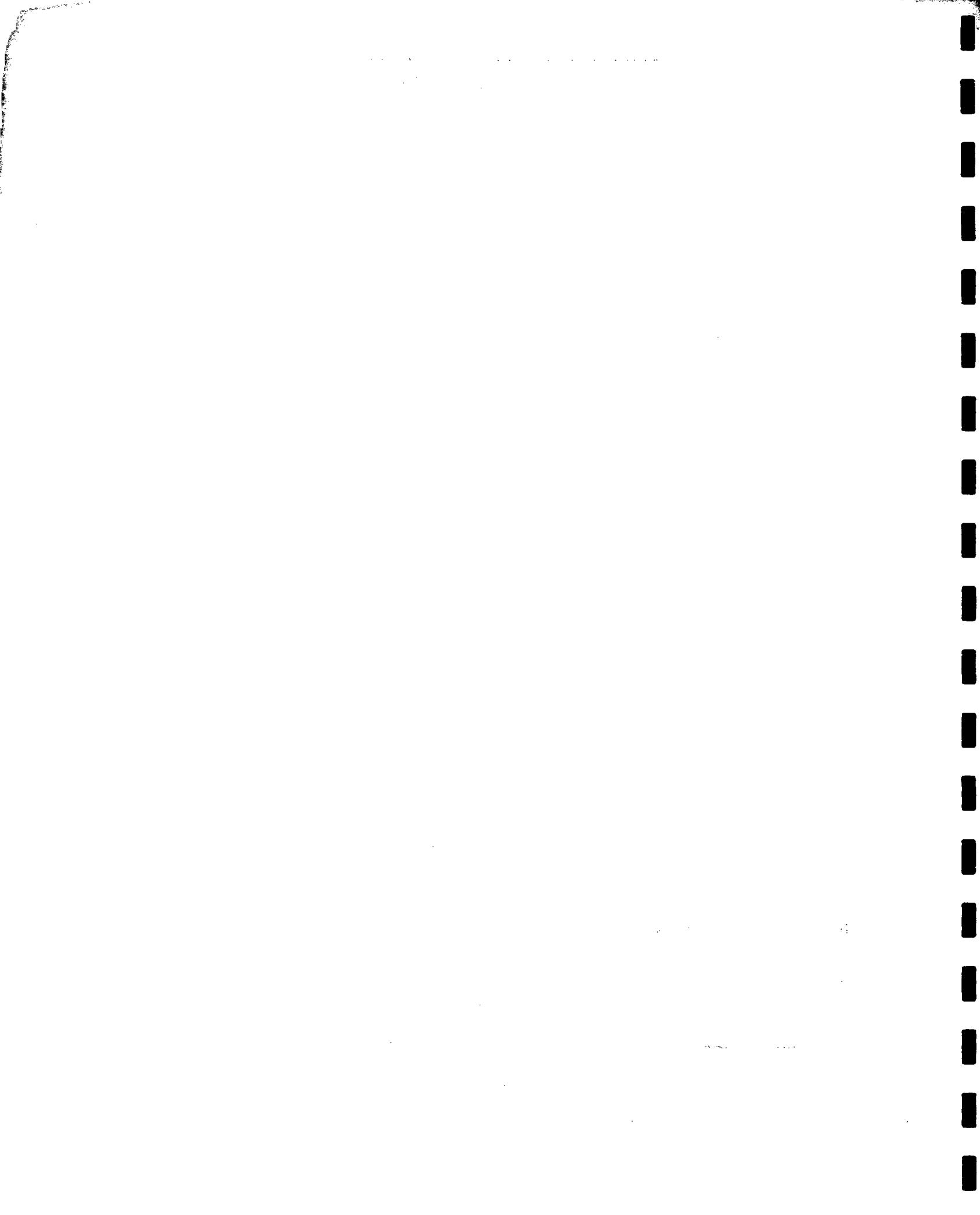


David G. Phillips, P.E.  
Senior Project Engineer



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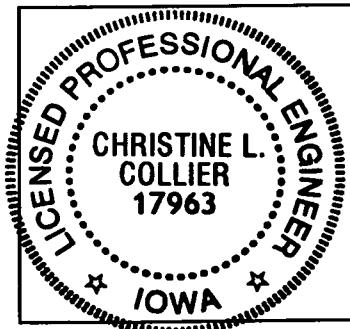
cc: ✓Addressee  
Mr. Virgil Anderson, Anderson Excavating  
IDNR Field Office #4  
File



**BARKER LEMAR**  
ENGINEERING CONSULTANTS

**2006 ANNUAL WATER QUALITY REPORT  
CARTER LAKE C & D LANDFILL (CLOSED)  
CARTER LAKE, IOWA**

**PERMIT No. 78-SDP-02-80C  
PROJECT No. ANDEX 06101  
NOVEMBER 2006**



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Christine L. Collier

Date: 11/20/06

Christine L. Collier, P.E.

License No. 17963

My license renewal date is December 31, 2007

Pages or sheets covered by this seal:

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## **1.0 INTRODUCTION**

**BARKER LEMAR ENGINEERING CONSULTANTS (BARKER LEMAR)**, on behalf of our client, Anderson Excavating Company, has completed the required groundwater sampling at the Carter Lake C & D Landfill. This report has been prepared in general accordance with the requirements of Iowa Administrative Code (IAC) 567-114(455B) and additional IDNR requirements. This report summarizes the 2006 site groundwater monitoring program and provides analysis of the data collected.

### **1.1 BRIEF HISTORY OF THE SITE**

The site is a closed private construction and demolition (C&D) landfill located at the intersection of 13<sup>th</sup> Street and Locust Street in Carter Lake, Iowa. The site was used as a C&D landfill from 1980 through 1989. The site has since been covered and vegetated with grass and alfalfa. The landfill site covers approximately 20 acres, of which approximately 7 acres have been used as a landfill. The closure permit was issued on May 1, 1996.

### **1.2 GEOLOGY OF THE SITE**

The *Hydrogeologic Investigation Report* dated July 26, 1995, prepared by Geotechnical Services Inc. provided the following geological setting:

*The site is situated in the flood plain between Carter Lake and the Missouri River. This area is characterized by alluvial bedding plains consisting of sandy and silty clays with sand seams.*

*The near surface strata consist of fill; primarily consisting of silty sand, mixed with wood and brick pieces. Blow counts for the split spoon sampler indicated this strata to be well compacted. The fill extends to approximately 15 feet below grade. Alluvium consisting of silty clay was identified below the fill and was found to be saturated with groundwater and showed less consistency than the surface fill. The alluvium changed to fine to well graded sand at a depth of 20-25 feet below grade. Clay lenses were found to be interbedded within the sandy alluvium. The fine grained alluvial sand encountered at the site extended to depths in excess of 90 feet. Bedrock was not encountered in any of the soil borings performed at the site.*

### **1.3 HYDROLOGY OF THE SITE**

The above-referenced Hydrogeological Investigation Report provided the following hydrogeologic setting:

*The near surface groundwater was found to be approximately 10-15 feet below grade. Well clusters were installed at the site with the well screens at 5-20 feet below grade, 45-55 feet below grade, and 75-85 feet below grade. Monitoring wells forming each individual well cluster exhibited the same static water levels; therefore, the surficial aquifer beneath the site appears to be extending to depths in excess of 90 feet below grade. These observations are consistent with the data obtained from the Geologic Survey of Omaha, Council Bluffs (1968).*

*The local groundwater flow direction at the site was found to be in southeasterly direction near the surface and northeasterly at 50 feet below the groundwater table. The proximity of Carter Lake and the Missouri River appears to have influenced the groundwater flow direction at the site.*

*Slug tests were performed to determine the hydraulic conductivity of the water bearing strata beneath the site. Whereas, the near surface clayey fill, as well as the sandy alluvial aquifer, exhibited rapid groundwater recharge; distinct differences were observed in the rate of recharge from both of these water bearing units. The fine grained sandy aquifer failed to show any draw down when the groundwater was withdrawn from the monitoring well at a rate of 15 gallons per minute. Due to this extremely rapid recharge, slug test data could not be gathered from any of the deeper monitoring wells. The hydraulic conductivity for the monitoring wells screened partially in the near surface clays, was found to be in the range of 0.40 – 1.04 m/d.*

*The installation of monitoring wells at the site resulted in three well clusters located to the east, west and south of the site. The vertical groundwater flow gradient was calculated by comparing the groundwater levels in the individual wells of each well cluster. The vertical groundwater flow gradient ranged from 0.019 to 0.055 ft/ft upwards and 0.052 ft/ft downwards.*

#### **1.4 PREVIOUS LAND USE**

The Carter Lake C&D landfill is located within the city limit of Carter Lake. Prior land use information has not been obtained. However, the 1960 IDOT aerial photograph providing coverage of the site was reviewed for the *Preliminary Groundwater Assessment* dated April 8, 1998, prepared by **BARKER LEMAR**. The following is an excerpt from the report:

*In the 1960 aerial photograph, the site appears to be covered with small vegetation. Trees appear to be present around the perimeter of the property and in the northwest corner. Objects typical of an auto salvage yard appear to be present to the west of the site. Trees and brush along with some small structures are present to the east of the site. Trees and brush surrounding a large open area are present to the south of the site. Trees and brush along with some small structures are present to the north of the site.*

#### **1.5 SOLID WASTE STREAMS**

The site received construction and demolition waste from 1980 to 1989.

## **1.6 REPORT CONTENTS**

Sampling was performed in general accordance with Iowa Administrative Code (IAC) Section 114.26(4) and the provisions identified in the landfill permit. This report addresses water quality data collected during the 2006 sampling event and discusses the following items:

- Changes to the groundwater monitoring system since the Fall 2005 Annual Water Quality Report;
- Observations made during the collection of groundwater and surface water samples;
- Results of the physical parameters measured during sample collection;
- Changes or maintenance needed in the monitoring system;
- The statistical treatment and evaluation of the chemical data;
- Evaluation of potential groundwater mounding and impacts on monitoring wells;
- Evaluation of upgradient groundwater and surface water monitoring points;
- Evaluation of potential leachate migration as detected at groundwater monitoring wells;
- Evaluation of potential impact of the landfill on surface water quality; and
- Recommendations for future monitoring.

The report also provides a summary listing of analytical data, statistical computation results, graphs of statistical exceptions, and a digital copy of the data.

## **2.0 FIELD ACTIVITIES AND PROCEDURES**

Groundwater monitoring wells were developed and sampled by **BARKER LEMAR** personnel on October 11, 2006. This activity represents the routine annual sampling event for 2006. Water samples from seven (7) groundwater-monitoring wells were collected during this event. The surface monitoring point was dry during the 2006 sampling event.

Sampling forms for the 2006 sampling event are included in Appendix A. The general field measurement and sampling procedures used are outlined below:

- Static groundwater levels and total well depths were measured using an electronic water level indicator.
- Groundwater wells were purged of approximately three well volumes or until dry using dedicated Waterra® development/sampling pumps and disposable bailers. Groundwater elevations were measured before and after well development.

- Field measurements of pH, temperature, and specific conductance were collected during groundwater monitoring well development and used as indicators of well conditions prior to sample collection.
- Groundwater samples were collected by using Waterra® pumps and/or disposable hand bailers, and by transferring the samples into laboratory-prepared containers. A dedicated Waterra® pump has not been installed in MW-7R. Hence, a disposable hand bailer was used to collect water from this well. Samples collected for dissolved metals analysis were field-filtered using 0.45 micron filters.
- Groundwater samples were submitted for laboratory analysis under chain-of-custody procedures. Analysis was performed as indicated in the Hydrologic Monitoring System Plan (HMS), permit Amendment #2 dated March 17, 2000 indicating samples should be analyzed for the parameters listed in IAC 567 Sections 114.26(4)(e) and (f), and the provisions identified in the landfill permit.

### **3.0 MONITORING SYSTEM**

The groundwater monitoring system in-place at the site is comprised of seven monitoring wells (MW-1, MW-3, MW-4, MW-5, MW-6, MW-7R, and MW-8) and one surface water monitoring point (SW-1). Figure 1 shows the location of the monitoring system points. The function as an upgradient, background, or downgradient sampling location for the water table and deep flow groundwater and surface water monitoring points is depicted in Figure 1.

#### **3.1 GROUNDWATER MONITORING SYSTEM**

Two groundwater regimes (the water table aquifer and the deep flow) are monitored by the corresponding monitoring wells as shown in Table 1.

**TABLE 1**  
**MONITORING WELL NETWORK**

<b>REGIME</b>	<b>MONITORING WELLS</b>
Aquifer 1 (Upper/Surficial)	Upgradient: MW-7R Downgradient: MW-1, MW-3, MW-5,
Aquifer 1 (Deep Flow)	Upgradient: MW-4, MW-6 Downgradient: MW-8

#### **3.2 SURFACE WATER MONITORING POINTS**

A surface water monitoring point, SW-1 has been established for the site at the southeast corner of the landfill. It is a drainage ditch that collects the majority of the surface water run-off from the site. The location of this point is shown on Figure 1.

## **4.0 MONITORING SYSTEM PERFORMANCE EVALUATION**

The hydrologic monitoring system was re-evaluated to determine the reliability of the performance of the monitoring points based on the following tasks.

- The high and low groundwater levels were compared to well depth/screened interval.
- The frequency of non-flowing surface water sampling points was evaluated.
- Water level conditions in the monitoring wells were reviewed to evaluate possible changes in the hydrologic setting/flow paths due to landfilling activities.
- Well depths were measured to evaluate integrity and siltation.
- A visual inspection of well integrity was performed during the sampling event.

### **4.1 WATER LEVEL MEASUREMENTS**

The results of the water level measurements and well depth measurements are shown in Table 2 (Summary of Groundwater Levels and Well Performance) on the following page. The October 2006 data indicated that groundwater levels ranged from 964.76 feet above mean sea level (ft amsl) in MW-8 to 971.23 ft amsl in MW-7R. Comparing the water levels recorded during the last two sampling events, the fluctuations ranged from an increase of 0.28 ft in MW-7R to an increase of 1.15 ft in MW-5 with seven wells showing an increase. Water levels in the monitoring wells have been sufficient to yield ground water samples during the 2006 sampling event.

The monitoring wells in the Aquifer 1 (water table) were observed to have piezometric levels within the screened interval in the 2006 sampling event. The monitoring wells in the Aquifer 1 (deep flow) were observed to have piezometric levels above the screened interval in the 2006 sampling event, as expected for wells monitoring deep flow.

### **4.2 GROUNDWATER FLOW**

Groundwater contours were determined for Aquifer 1 (water table and deep flow) by using water elevation data collected by **BARKER LEMAR** personnel on October 11, 2006. The groundwater contours for the Aquifer 1, water table and deep flow are presented in Figures 2 and 3, respectively. The historical groundwater flow directions are summarized in the Table 3.

**TABLE 2**  
**SUMMARY OF GROUNDWATER LEVELS AND WELL PERFORMANCE**  
**CARTER LAKE C & D LANDFILL**  
**CARTER LAKE, IOWA**  
**PERMIT NO. 78-SDP-02-80C-CND**  
**PROJECT NO. ANDEX 06101**

WELL	TOC	TOS	TD	DATUM	DATE OF MEASUREMENT	
					October 10, 2005	October 11, 2006
MW-1	985.16	977.0	23.5	GROUNDWATER LEVEL	15.82	15.10
				GROUNDWATER ELEVATION	969.34	970.06
				MEASURED WELL DEPTH	20.3	20.6
MW-3	986.3	978.0	23.5	GROUNDWATER LEVEL	19.65	19.05
				GROUNDWATER ELEVATION	966.65	967.25
				MEASURED WELL DEPTH	20.5	21.0
MW-4	985.66	935.6	58.4	GROUNDWATER LEVEL	18.96	18.45
				GROUNDWATER ELEVATION	966.70	967.21
				MEASURED WELL DEPTH	58.1	58.3
MW-5	985.15 see note below	977.9	24.5	GROUNDWATER LEVEL	19.40	18.25
				GROUNDWATER ELEVATION	965.75	966.90
				MEASURED WELL DEPTH	24.5	23.7
MW-6	984.99 see note below	938.1	57.4	GROUNDWATER LEVEL	19.00	18.05
				GROUNDWATER ELEVATION	965.99	966.94
				MEASURED WELL DEPTH	56.8	56.7
MW-7R	986.13	978.0	23.1	GROUNDWATER LEVEL	15.18	14.90
				GROUNDWATER ELEVATION	970.95	971.23
				MEASURED WELL DEPTH	23.1	23.1
MW-8	982.05	934.1	56.9	GROUNDWATER LEVEL	17.29	16.80
				GROUNDWATER ELEVATION	964.76	965.25
				MEASURED WELL DEPTH	56.4	56.5

**Notes:**

All measurements in feet.

NA - Data are not available.

TOC - Top of casing elevation, reference for water level measurements.

TOS - Top of screen elevation.

TD - Total depth (as originally reported).

On October 11, 2006, the casings for MW-5 and MW-6 were repaired

8" were removed from MW-5 casing:  $985.82 - 0.67 = 985.15$

5.5" were removed from MW-6 casing:  $985.45 - 0.46 = 984.99$

Review of the Aquifer 1 (water table) groundwater flow pattern indicates that in October 2006 the general flow direction of this aquifer was in a southeasterly direction with a gradient of approximately 0.009 ft/ft. The groundwater flow direction for the potentiometric surface of the Aquifer 1 (deep flow) has been observed to exhibit a flow direction in a northwesterly direction across the site with a general gradient of 0.013 ft/ft.

**TABLE 3**  
**HISTORICAL GROUNDWATER FLOW DIRECTIONS**

Date	Aquifer 1 (Water Table)	Aquifer 1 (Deep Flow)
May 9, 1996	South	East/Southeast
October 2, 1996	East/Southeast	North*
January 27, 1997	Southeast	North*
April 15, 1997	East	North*
July 23, 1997	East	North*
October 15, 1997	East**	North*
April 6, 1998	East**	North*
October 13, 1998	Southeast	North*
April 15, 1999	Northeast	Northwest
October 7, 1999	Southeast	Northwest
October 12, 2000***	Southeast	Northwest
October 4, 2001	Southeast	Northwest
October 3, 2002	Southeast	Northwest
October 15, 2003	Southeast	Northwest
October 4, 2004	Southeast	Northwest
October 10, 2004	Southeast	Northwest
October 11, 2006	Southeast	Northwest

\* Indicates a converging flow pattern. The centralized flow direction is indicated.

\*\* Indicates a diverging flow pattern. The centralized flow direction is indicated.

\*\*\* As of 2000, the landfill was sampled annually.

#### 4.3 WELL SILITATION

The monitoring well depths measured by **BARKER LEMAR** personnel in the 2006 sampling event were within 0.8 foot of the installed depth in five of the seven wells. Monitoring wells MW-1 and

MW-3 were 2.9 and 2.5 feet shallower, respectively, than the installed depth during the October 2006 sampling event. Based on the ability of the dedicated pumping system to remove accumulated sediment, it appears unlikely that siltation will adversely impact the groundwater monitoring points at this site.

#### **4.4 SAMPLING POINT OBSERVATIONS**

In general, problems regarding the integrity of the monitoring wells or sampling points were not noted.

#### **4.5 FREQUENCY OF NON-FLOWING SAMPLING POINTS**

SW-1 was not flowing during the 2006 sampling event. As this is a drainage ditch for storm water leaving the site, flow will only be present during or shortly after storm events.

#### **4.6 DISCUSSION OF POTENTIAL GROUNDWATER MOUNDING**

Figure 2 shows the contours of the upper water table aquifer. There are no piezometers at this site; therefore, this section does not apply.

#### **4.7 DISCUSSION OF UPGRAIDENT MONITORING POINTS**

##### Upgradient Groundwater Monitoring Points

The upgradient monitoring well for Aquifer 1 (water table) is MW-7R. The water table contours as shown on Figure 2 indicate that the groundwater level in MW-7R is at a higher elevation than the interpolated groundwater levels within the adjacent portion of the waste boundary. In addition, comparing the water quality data for MW-7R with the downgradient wells, significant degradation of the groundwater quality due to leachate influence has not been observed. The following is a summary of the upgradient monitoring well for Aquifer 1 (water table):

Statistical exceedances were measured in upgradient monitoring point **MW-7R** for dissolved arsenic in the 2006 sampling event. Water quality data for this well is available beginning in October 2001. New maximum concentrations were reported for chemical oxygen demand (COD), chloride, dissolved arsenic, dissolved iron, and specific conductance in the 2006 sampling event. A generally increasing dissolved arsenic concentration trend was noted in the data beginning in 2003 and a generally increasing

dissolved iron concentration trend was noted in the data beginning in 2002. No established trends in concentrations were noted in the remaining analytes.

The upgradient monitoring wells for Aquifer 1 (deep flow) are MW-4 and MW-6. The deep flow water table elevations as shown on Figure 3 indicate that the groundwater levels in MW-4 and MW-6 are at a higher elevation than the groundwater levels in the downgradient monitoring well MW-8. In addition, comparing the water quality data for MW-4 and MW-6 with MW-8, degradation of the groundwater quality due to leachate influence has not been observed. The following is a summary of the upgradient monitoring wells for Aquifer 1 (deep flow):

No statistical exceedances were measured in upgradient monitoring well **MW-4** in 2006. Water quality data for this well is available beginning in October 1996. A new maximum concentration was reported for dissolved arsenic in the 2006 sampling event. No established trends in concentrations were noted in the analytes.

No statistical exceedances were measured in upgradient monitoring well **MW-6** in 2006. Water quality data for this well is available beginning in October 1996. No new minimum or maximum concentrations were observed in 2006. No established trends in concentrations were noted in the analytes.

#### Upgradient Surface Water Monitoring Point

An upgradient surface water monitoring point has not been established for this site. There is only one surface water monitoring point, SW-1 (downgradient) located at the southeast corner of the landfill. This point is a drainage ditch that collects the majority of the surface water run-off from the site during precipitation events.

#### **4.8 MONITORING SYSTEM RECOMMENDATIONS**

Hydrologic monitoring at the site has been conducted in accordance with the approved Hydrologic Monitoring System Plan (HMSP) dated April 15, 1996 and revisions dated April 25, 1996, as prepared by **BARKER LEMAR**, the special provisions identified in the landfill permit, Permit Amendment #1, and Permit Amendment #2. No recommendations regarding modifications to the hydrologic monitoring system are needed as of the date of this report.

## **5.0 DATA EVALUATION METHODS**

The statistical evaluation of the chemical data was completed in accordance with IAC 567 Section 114.26(6).

### **5.1 WELL GROUPING**

The groundwater regimes discussed in Section 3.1 were evaluated separately as was the surface water monitoring point. Upgradient groundwater monitoring points were selected from each group for statistical comparison. The selection of upgradient groundwater monitoring points was based on the "Preliminary Groundwater Assessment", submitted by **BARKER LEMAR** in April 1998.

### **5.2 CONTROL LIMITS**

Once the groupings were completed, the mean, standard deviation, and control limits were calculated for each of the chemical parameters in the upgradient monitoring point. The control limit represents the limit at which a statistical exceedance beyond the background concentration has occurred. For the purpose of this evaluation, the control limits were defined as the mean of the concentrations for the upgradient monitoring point plus/minus two times the standard deviation for each parameter. The lower control limit was only used for evaluation of pH levels.

### **5.3 METHOD DETECTION LIMITS**

Many of the parameters were observed at concentrations less than the method detection limits (MDLs). The mean, standard deviation, and control limits were computed by utilizing the reporting limit value in the computations (i.e., <0.05 becomes 0.05). In situations in which each of the upgradient monitoring point concentrations was below the MDLs, the standard deviation and control limits were not calculated. It should be noted that in some cases in which control limits were not calculated for the aforementioned reason, the measured downgradient concentration exceeded the upgradient mean.

### **5.4 REGULATORY ACTION LIMITS**

In addition to evaluating the concentration in comparison to upgradient control limits, the concentrations were also compared to current United States Environmental Protection Agency (USEPA) Maximum Contaminant Levels (MCLs), Negligible Risk Levels (NRLs) and Health

Advisory Levels (HALs). IDNR guidance documents define the “action level” for groundwater as the following:

*“As defined by 567 - 133.2 (455B, 455E), action level means the HAL, if one exists. If there is no HAL, then the NRL, if one exists. If there is no HAL or NRL, then the MCL. If there is no HAL, NRL, or MCL, an action level may be established by the department based on current technical literature and recommended guidelines of the USEPA and recognized experts, on a case-by-case basis.”*

The dissolved arsenic concentration in monitoring wells MW-4, MW-5, MW-6, MW-7R, and MW-8 exceeded the MCL of 0.01 mg/L in the 2006 sampling event. No other exceedances of regulatory action levels were noted.

## **6.0 EVALUATION OF WATER QUALITY PARAMETERS**

Section 6.1 provides a summary of statistical exceedances, upgradient mean exceedances, new maximum and minimum concentrations, and generally observed trends for each downgradient monitoring point. Please note, for parameters with insufficient historical data, typically four data points or less, discussions in regard to minimum/maximum concentrations or generally observed trends are not included.

The historical analytical results of the downgradient monitoring wells are presented in Appendix B (Summary of Groundwater Chemistry). The analytical data report for October 2006 is included in Appendix C. Parameters were graphed in relation to the current mean and standard deviation for each group. Results that exceeded the current upgradient control limits are presented in the Exceedance Tables in Appendix D. The graphs depicting the changes of each parameter in each downgradient monitoring point are included in Appendix E. Note, some graphs may depict values that exceed the upper control limit and are not included in the summary of exceedances table. These values are not reported as exceedances due to the upper control limit being less than the detection level of that parameter’s test method.

### **6.1 MONITORING WELL SUMMARY**

Statistical exceedances were measured in monitoring well **MW-1** for COD, ammonia nitrogen, and total organic halogens (TOH) during the 2006 sampling event. Water quality data for this

well is available beginning in October 1996. New maximum concentrations were reported for COD, ammonia nitrogen, and TOH in the 2006 sampling event. A generally decreasing dissolved iron concentration trend was noted in data beginning in 1999. No established trends in concentrations were noted in the remaining analytes.

Statistical exceedances were measured in monitoring well **MW-3** for chloride during the 2006 sampling event. Water quality data for this well is available beginning in October 1996. A new minimum concentration was reported for TOH in the 2006 sampling event. No established trends in concentrations were noted in the analytes.

Statistical exceedances were measured in monitoring well **MW-5** for TOH during the 2006 sampling event. Water quality data for this well is available beginning in October 1996. No new minimum or maximum concentrations were observed in 2006. No established trends in concentrations were noted in the analytes.

No statistical exceedances were measured in monitoring well **MW-8** in 2006. Water quality data for this well is available beginning in October 1996. A new minimum concentration was reported for chloride in the 2006 sampling event. A generally decreasing chloride concentration trend was noted in data beginning in 1998 and a generally decreasing COD concentration trend was noted in data beginning in 1999. No established trends in concentrations were noted in the remaining analytes.

The surface water monitoring point **SW-1** has been dry. No data is available for this monitoring point.

## **7.0 SUMMARY AND RECOMMENDATIONS**

### **7.1 POTENTIAL LEACHATE MIGRATION**

A summary of the 2005 and 2006 exceedances computed for the downgradient monitoring wells are shown in Tables 4A and 4B, respectively.

**TABLE 4A**  
**2005 SUMMARY OF STATISTICAL EXCEEDANCES**

Parameter	MW-1	MW-3	MW-5
Chloride	X		
COD	X		X
Ammonia Nitrogen			
Total Organic Halogens			

**TABLE 4B**  
**2006 SUMMARY OF STATISTICAL EXCEEDANCES**

Parameter	MW-1	MW-3	MW-5
Chloride		X	
COD	X		
Ammonia Nitrogen	X		
Total Organic Halogens	X		X

Minor changes in water quality from last year were noted. Statistical exceedances for ammonia nitrogen increased by one well. Statistical exceedances for TOH increased by two wells and statistical exceedances for COD decreased by one well.

Monitoring well MW-1 indicated a generally decreasing dissolved iron concentration trend beginning in 1999. A generally increasing dissolved iron and dissolved arsenic concentration trend was noted in MW-7R beginning in 2002 and 2003 respectively. MW-8 indicated a generally decreasing chloride concentration trend beginning in 1998 and a generally decreasing COD concentration trend beginning in 1999. The data should continue to be reviewed as new data becomes available to determine if the parameter trend observations are consistent.

Overall, concentrations of indicator parameters have remained relatively consistent within the range of previous measurements. A complete analysis of the historical data can be found in Appendix E. Historical trends should be considered during the evaluation of the exceedance values.

The MCL for dissolved arsenic was exceeded in MW-4, MW-5, MW-6, MW-7R, and MW-8 in the 2006 sampling event. The MCL exceedances for dissolved arsenic have been evident at this

landfill since 1996. Based on the widespread occurrence of dissolved arsenic in the groundwater and both upgradient and downgradient monitoring wells showing measurable concentrations, it appears that the Carter Lake C&D Landfill is not the arsenic source.

The 0.01 mg/L arsenic concentration contour for the 2006 sampling event results are depicted for water table wells on Figure 4 and for deep flow wells on Figure 5, as requested by the IDNR correspondence dated November 13, 1998. The upgradient monitoring well for Aquifer 1 (water table), MW-7R as shown on Figure 2, indicated similar concentration to the wells located downgradient. MW-1 and MW-3 are situated downgradient of Aquifer 1 (water table) groundwater flow direction and showed arsenic levels less than the MCL in the 2006 sampling event. Likewise, upgradient monitoring wells, MW-4 and MW-6, for Aquifer 1 (deep flow) indicated higher arsenic concentrations than the downgradient well MW-8. This is an indication that the Carter Lake C&D Landfill is not the source of arsenic impact. Arsenic contamination investigation will be continued in future Annual Water Quality Reports.

## **7.2 POTENTIAL RECEPTORS**

Pursuant to the letter from IDNR as referenced in Section 1.0 of this report, if MCLs are exceeded (at any groundwater monitoring point), information on potential receptors should be provided. As mentioned above, the MCL for dissolved arsenic was exceeded in monitoring wells MW-4, MW-5, MW-6, MW-7R, and MW-8. Potential receptors downgradient from the landfill include Carter Lake, the Missouri River, and residential houses. However, as discussed, it is believed the arsenic is originating upgradient from the landfill.

## **7.3 IMPACT OF THE LANDFILL ON SURFACE WATER QUALITY**

Surface water monitoring point SW-1 has been dry since the beginning of the sampling events.

## **7.4 CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE MONITORING**

Based on these results, **BARKER LEMAR** recommends continued routine annual water sampling for the parameters listed in IAC Chapter 114.26(4)(e) and (f) and dissolved arsenic as stated in the current closure permit and permit Amendment #2.

## **8.0 GENERAL COMMENTS**

The analysis and opinions expressed in this report are based upon data obtained from the samples collected at the indicated locations and from any other information discussed in this report. This report does not reflect any variations in subsurface stratigraphy, hydrogeology, or chemical concentrations that may occur between sampling locations or across the site. Actual subsurface conditions may vary and may not become evident without further exploration.

**BARKER LEMAR** has prepared this report for the exclusive use of our client for the specific application to the project discussed. No warranty is expressly stated or implied in this report. **BARKER LEMAR** has relied upon information furnished by others as noted in the report, and **BARKER LEMAR** accepts no responsibility for any deficiency, misstatements, or inaccuracy in this report as a result of misstatements, omissions, misrepresentations, fraudulent, or inaccurate information or data provided by others.

## **9.0 REFERENCES**

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2. Barker Environmental Services, Inc. *Revised Hydrologic Monitoring System Plan, C&D Landfill Carter Lake, Iowa*. August 29, 1996.
3. Barker Environmental Services, Inc. *1997 Annual Water Quality Report, Carter Lake C&D Landfill (CLOSED)*. December 29, 1997.
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7. Barker, Lemar and Associates, Inc. *2000 Annual Water Quality Report, Carter Lake C&D Landfill (CLOSED)*. November 21, 2000.
8. **BARKER LEMAR ENGINEERING CONSULTANTS**. *2001 Annual Water Quality Report, Carter Lake C&D Landfill (CLOSED)*. November 26, 2001.

9. **BARKER LEMAR ENGINEERING CONSULTANTS.** *2002 Annual Water Quality Report, Carter Lake C&D Landfill (CLOSED).* November 28, 2002.
10. **BARKER LEMAR ENGINEERING CONSULTANTS.** *2003 Annual Water Quality Report, Carter Lake C&D Landfill (CLOSED).* November 24, 2003.
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12. **BARKER LEMAR ENGINEERING CONSULTANTS.** *2005 Annual Water Quality Report, Carter Lake C&D Landfill (CLOSED).* November, 2005.

## **FIGURES**

4850E

4900E

5000E

5100E

5200E

5300E

5400E

5500E

5600E

5650E

5250N

5200N

5100N

5000N

4900N

4800N

4700N

4600N

4500N

LOCUST AVENUE

LOCATION OF PREVIOUS  
BENCHMARK B-55-92  
ELEV. 500 FT ELEV. 500 FT  
B-55-92 ELEV. 500 FT  
B-55-92 ELEV. 500 FT

SCALE



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## LEGEND

- |       |   |
|-------|---|
| MW-1  | MONITORING WELL                                       |
| SW-1  | SURFACE WATER SAMPLING POINT                          |
|       | PERMIT BOUNDARY                                       |
|       | FENCE LINE  |
|       | CENTERLINE OF ROAD                                    |
|       | GROUND SURFACE CONTOUR<br>(1 FT INTERVALS)            |
|       | BENCHMARK   |
| MW-7R | UPGRADIENT MONITORING WELL (AQUIFER 1, WATER TABLE)   |
| MW-1  | DOWNGRADIENT MONITORING WELL (AQUIFER 1, WATER TABLE) |
| MW-4  | UPGRADIENT MONITORING WELL (AQUIFER 1, DEEP FLOW)     |
| MW-8  | DOWNGRADIENT MONITORING WELL (AQUIFER 1, DEEP FLOW)   |
| SW-1  | DOWNGRADIENT SURFACE WATER MONITORING POINT           |

AQUIFER 1, WATER TABLE

UPGRADIENT WELL:  
MW-7R  
DOWNGRADIENT WELLS:  
MW-1, MW-3, MW-5

AQUIFER 1, DEEP FLOW

UPGRADIENT WELLS:  
MW-4, MW-6  
DOWNGRADIENT WELL:  
MW-8

SURFACE WATER MONITORING POINT

DOWNGRADIENT POINT:  
SW-1

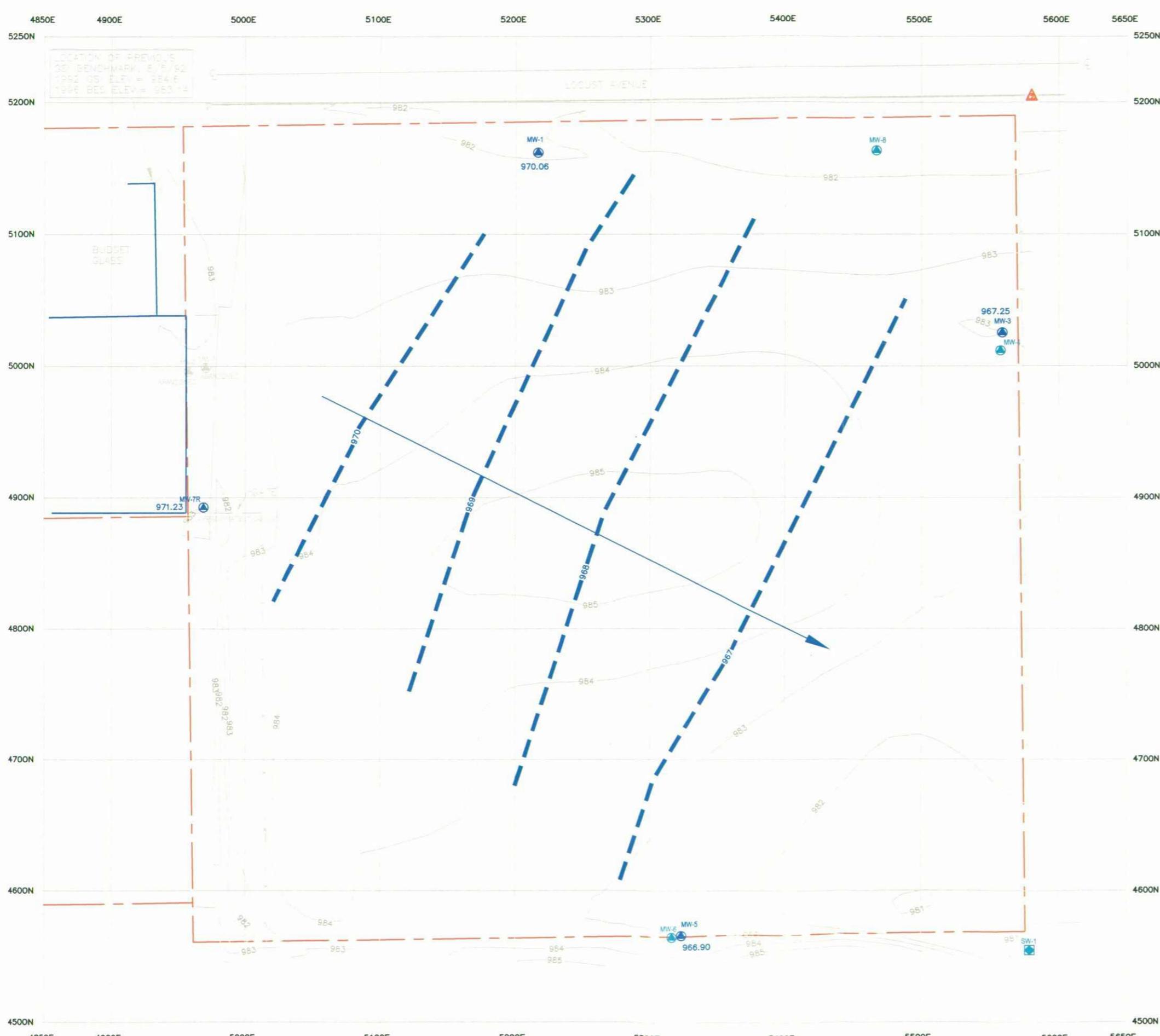
## REFERENCE:

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- HYDROGEOLOGIC MONITORING SYSTEMS PLAN FOR C & D LANDFILL CLOSURE, GSI, JULY 26, 1995
- CLOSURE DESIGN REPORT, C & D LANDFILL GSI, AUGUST 10, 1992
- PLAN FOR ANDERSON EXCAVATING AND WRECKING, 13TH AND LOCUST ST. CARTER LAKE, IOWA, JIF AND ASSOC., APRIL 4, 1980
- AUDITOR'S OFFICIAL PLAT, POTTAWATTAMIE COUNTY, IOWA CARTER LAKE, IOWA, PAGE D-25, JAN. 1979

CARTER LAKE C & D LANDFILL  
CARTER LAKE, IOWA  
PROJECT NO. ANDEX 06101  
DRAWING DATE: NOVEMBER 2006

APPROVED  
MONITORING NETWORKFIGURE  
1

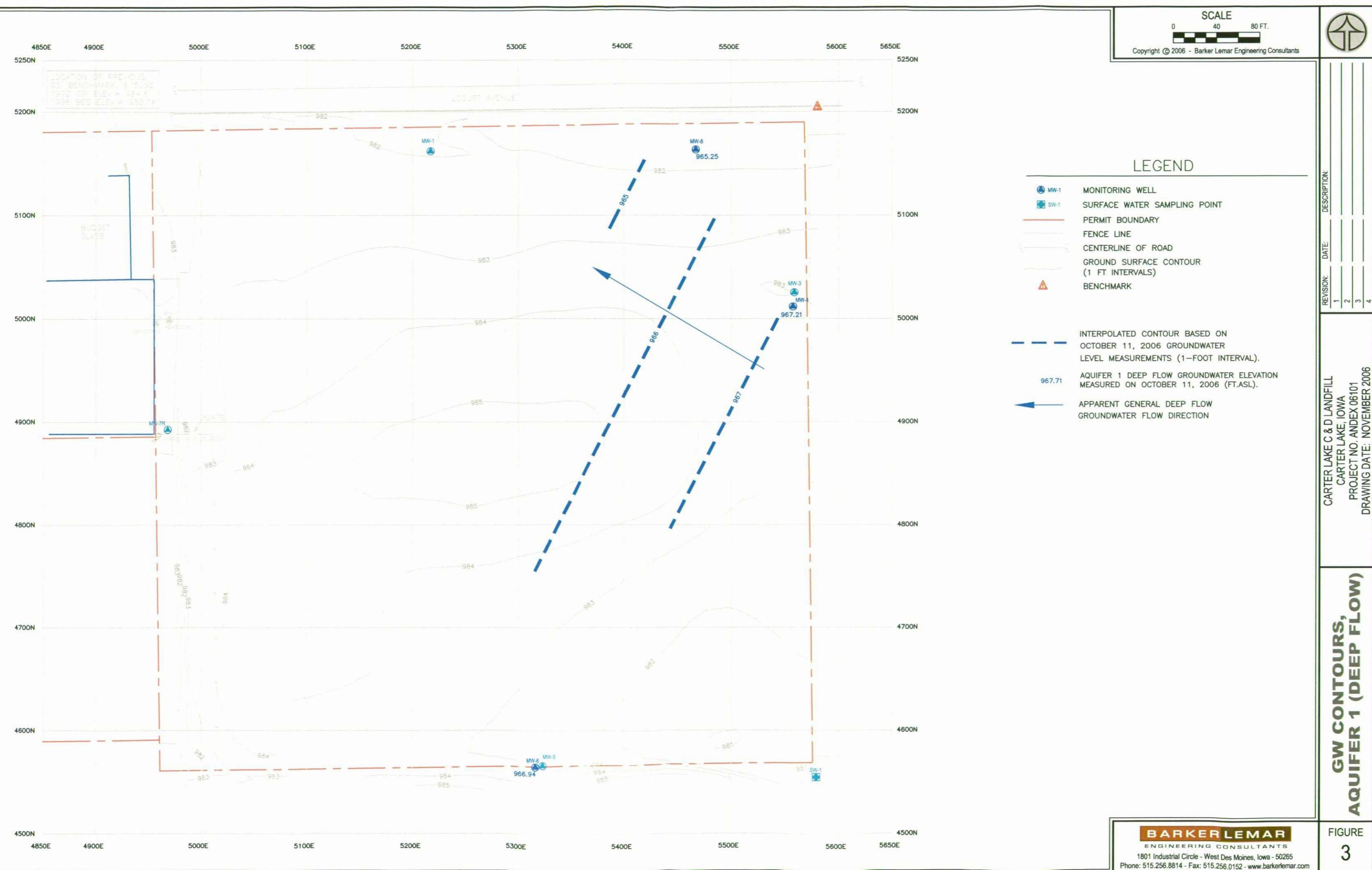
**BARKER LEMAR**  
ENGINEERING CONSULTANTS  
1801 Industrial Circle - West Des Moines, Iowa - 50265  
Phone: 515.256.8814 - Fax: 515.256.0152 - www.barkerlemar.com





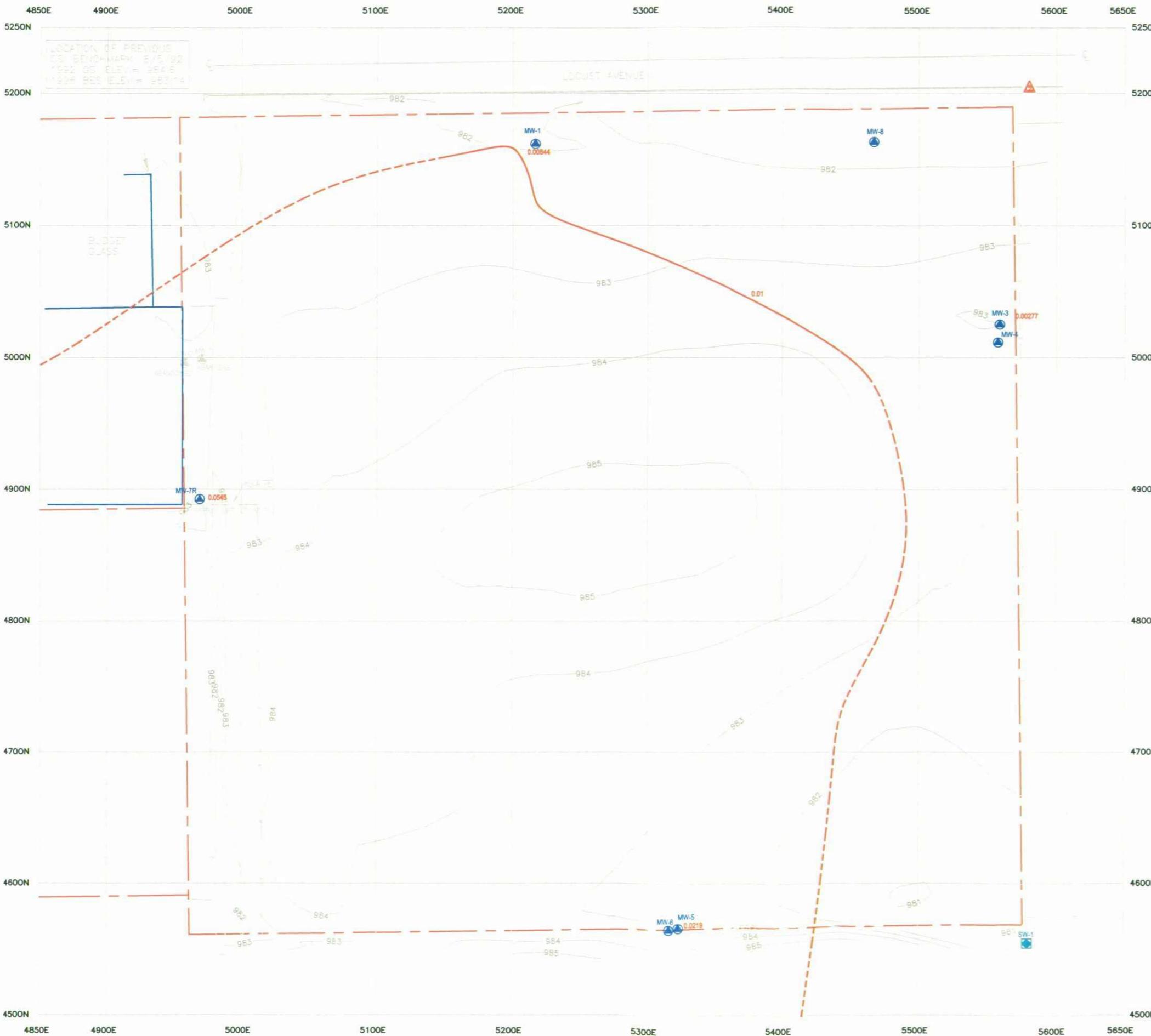
SCALE  
0 40 80 FT.

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SCALE  
0 40 80 FT.

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**LEGEND**

- MW-1 MONITORING WELL
- SW-1 SURFACE WATER SAMPLING POINT
- PERMIT BOUNDARY
- FENCE LINE
- CENTERLINE OF ROAD
- GROUND SURFACE CONTOUR (1 FT INTERVALS)
- BENCHMARK
- 0.01 mg/L ARSENIC CONTAMINATION PLUME
- INTERPOLATED 0.01 mg/L ARSENIC CONTAMINATION PLUME
- 0.0025 ARSENIC CONTAMINATION LEVEL AQUIFER 1 (WATER TABLE) MEASURED OCTOBER 11, 2006

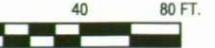
CARTER LAKE C & D LANDFILL  
CARTER LAKE, IOWA  
PROJECT NO. ANDEX 06101  
DRAWING DATE: NOVEMBER 2006

**ARSENIC CONCENTRATIONS MAP (WATER TABLE)**

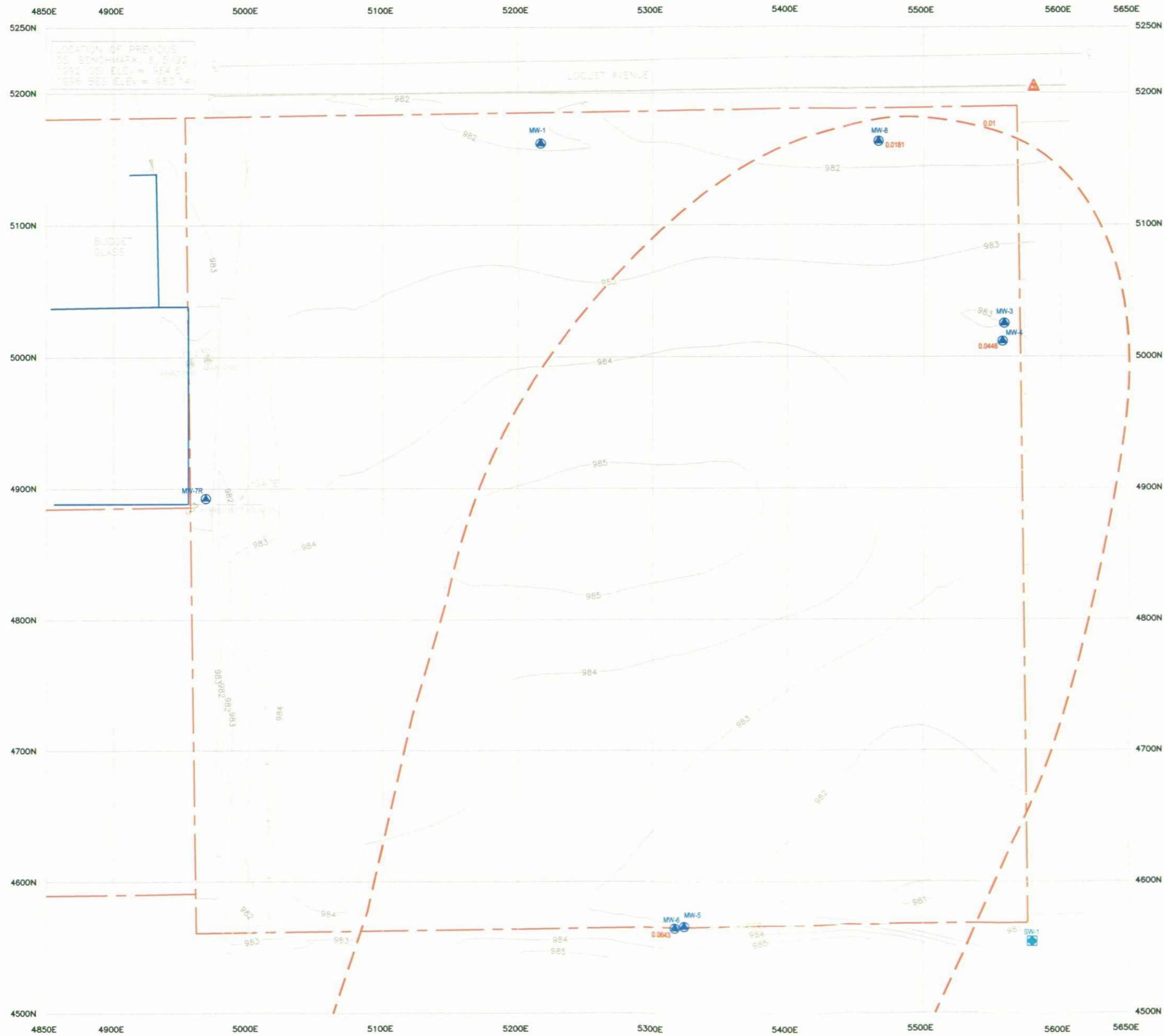
**BARKER LEMAR**  
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FIGURE 4

SCALE



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**ARSENIC CONCENTRATIONS MAP (DEEP FLOW)**

FIGURE  
5

**APPENDIX A**  
**FALL SAMPLING FORMS**

## LANDFILL GROUNDWATER SAMPLING DATA SHEET

**Project Information**

Project Name: Anderson Excavating  
 Project Location: Carter Lake, Iowa  
 Project Number: ANDEX 06101  
 SLF Permit No. 78-SDP-2-80C-CND  
 Weather Conditions: 40 degrees Fahrenheit, cloudy, 15- 20 mph winds

**Sampling Information**

Date Sampled: 10/11/2006  
 Sampling Crew: Kevin Hensley  
 Equipment: Water Level Heron  
 pH/Conductivity Hanna

1 Well No.	2 Date	3 Static Water Level ( ft )	4 Measured Well Depth ( ft )	5 Time at Start of Purging	6 Volume Purged ( gals )	7 Water Depth After Purging ( ft )	8 Well Purging Information				10 Stabilized pH ( S.U. )	11 Stabilized Conductivity ( uS/cm )	12 Stabilized Temperature ( C )	13 Well Properly Capped ( Y / N )	14 Litter or Standing Water ( Y / N )	15 Comments / Time Sampled									
							8 Water Depth Before Sampling ( ft )	9 Purging Equipment ( See Note )	10 Stabilized pH ( S.U. )	11 Stabilized Conductivity ( uS/cm )															
MW-1	10/11/2006	15.10	20.6	9:30 AM	1	Dry	18.25	W	6.89	2,537	13.7	Y	N												
MW-3	10/11/2006	19.05	21.0	10:15 AM	1	Dry	19.05	W	6.58	2,118	12.9	Y	N												
MW-4	10/11/2006	18.45	58.3	10:35 AM	20	19.20	18.52	W	7.07	2,051	13.1	Y	N												
MW-5	10/11/2006	18.25	23.7	11:10 AM	2	Dry	20.80	W	6.66	2,617	14.6	Y	Y	litter, repaired well casing, removed 8", and locked											
MW-6	10/11/2006	18.05	56.7	11:30 AM	18	18.50	18.10	W	7.48	2,289	12.8	Y	Y	litter, repaired well casing, removed 5.5", and locked											
MW-7R	10/11/2006	14.90	23.1	12:05 PM	4	Dry	21.20	B	6.93	2,418	13.9	Y	N												
MW-8	10/11/2006	16.80	56.5	9:45 AM	20	17.00	16.80	W	7.01	2,394	12.9	Y	N												
Surface Water Point No:		Width ( ft )		Depth ( in )		Flowrate ( lps )		Point Dry ( Y / N )		Water Flowing ( Y / N )		Ground Discolored ( Y / N )		Stabilized pH ( S.U. )		Stabilized Conductivity ( uS/cm )		Stabilized Temperature ( C )		Water Odor ( Y / N )		Water Discoloration ( Y / N )		Comments / Time Sampled	
SW-1	10/11/2006	NA	NA	NA	Y	N	N	N	N	NM	NM	NM	NA	NA	NA	NA	NA	Dry							

Note 1: VALID TYPES - Baler (B), Submersible (S), Waterra (W), Vacuum Pump (V), Dedicated Baler (DB), Other (describe in comments)

**FORM FOR GROUNDWATER SAMPLING AND/OR GROUNDWATER ELEVATION MEASUREMENT**

Site Name Anderson Excavating Permit No. 78-SDP-2-80C-CND  
 MW/Piezometer No. MW-1 Upgradient \_\_\_\_\_  
X Downgradient \_\_\_\_\_

Name of Person Sampling Kevin Hensley

**A. MONITORING WELL/PIEZOMETER CONDITIONS**

Well/Piezometer Capped? Yes  
 If NO, Explain \_\_\_\_\_

Standing Water/Litter?  
 If YES, Explain \_\_\_\_\_  
No \_\_\_\_\_

**B. GROUNDWATER ELEVATION MEASUREMENT (+/- 0.01 foot, MSL)**

Top of Casing Elevation	<u>985.16</u>	feet	Ground Elevation (ft.)	<u>981.95</u>
Drilled Well Depth (ft.)	<u>23.5</u>	feet	Casing Dia. (in.)	<u>2.0</u>
Measured Well Depth (ft.)	<u>20.6</u>	feet		

Equipment Used  
Heron

Groundwater Level (+/- 0.01 foot below top of inner casing, MSL):

	Date	Time	Depth to Groundwater (ft.)	Groundwater Elevation
Before Purging	<u>10/11/2006</u>	<u>9:30 AM</u>	<u>15.10</u>	<u>970.06</u>
After Purging			<u>Dry</u>	<u>Dry</u>
Before Sampling			<u>18.25</u>	<u>966.91</u>

**C. WELL PURGING\***

Quantity of Water Removed from Well (gallons)

No. of Well Volumes (based on current water level)

Was well pumped/bailed dry?

Equipment Used:  
 Bailler Type Not Used  
 Pump Type Waterra  
 If not dedicated, method of cleaning \_\_\_\_\_

**D. FIELD MEASUREMENTS**

Weather Conditions 40 degrees Fahrenheit, cloudy, 15-20 mph winds

Field Measurements (after stabilization):

Temperature	<u>13.7</u>	Units	<u>Celsius</u>
Equipment Used	<u>Hanna</u>	Units	
pH	<u>6.89</u>	Units	<u>Standard Units</u>
Equipment Used	<u>Hanna</u>	Units	<u>uS/cm.</u>
Spec. Conductance	<u>2.537</u>	Units	
Equipment Used	<u>Hanna</u>	Units	

**COMMENTS**

\*Omit if only measuring groundwater elevations.

**FORM FOR GROUNDWATER SAMPLING AND/OR GROUNDWATER ELEVATION MEASUREMENT**

Site Name	<u>Anderson Excavating</u>	Permit No.	<u>78-SDP-2-80C-CND</u>
MW/Piezometer No.	<u>MW-3</u>	Upgradient	<u></u>
		Downgradient	<u>X</u>
Name of Person Sampling	<u>Kevin Hensley</u>		

**A. MONITORING WELL/PIEZOMETER CONDITIONS**

Well/Piezometer Capped?	<u>Yes</u>	Standing Water/Litter?	<u>No</u>
If NO, Explain	<u></u>		

**B. GROUNDWATER ELEVATION MEASUREMENT (+/- 0.01 foot, MSL)**

Top of Casing Elevation	<u>986.30</u>	feet	Ground Elevation (ft.)	<u>983.00</u>
Drilled Well Depth (ft.)	<u>23.5</u>	feet	Casing Dia. (in.)	<u>2.0</u>
Measured Well Depth (ft.)	<u>21.0</u>	feet		

Equipment Used	<u>Heron</u>		
----------------	--------------	--	--

Groundwater Level (+/- 0.01 foot below top of inner casing, MSL):

	Date	Time	Depth to Groundwater (ft)	Groundwater Elevation
Before Purging	<u>10/11/2006</u>	<u>10:15 AM</u>	<u>19.05</u>	<u>967.25</u>
After Purging	<u></u>	<u></u>	<u>Dry</u>	<u>Dry</u>
Before Sampling	<u></u>	<u></u>	<u>19.05</u>	<u>967.25</u>

**C. WELL PURGING\***

Quantity of Water Removed from Well (gallons)	<u>1</u>
No. of Well Volumes (based on current water level)	<u>3</u>
Was well pumped/bailed dry?	<u>Yes</u>

Equipment Used:

Bailer Type	<u>Not Used</u>	Dedicated Bailer?	<u>No</u>
Pump Type	<u>Waterra</u>	Dedicated Pump?	<u>Yes</u>

If not dedicated, method of cleaning

**D. FIELD MEASUREMENTS\***

Weather Conditions	<u>40 degrees Fahrenheit, cloudy, 15- 20 mph winds</u>		
--------------------	--	--	--

Field Measurements (after stabilization):

Temperature	<u>12.9</u>	Units	<u>Celsius</u>
Equipment Used	<u>Hanna</u>		
pH	<u>6.58</u>	Units	<u>Standard Units</u>
Equipment Used	<u>Hanna</u>		
Spec. Conductance	<u>2,118</u>	Units	<u>uS/cm.</u>
Equipment Used	<u>Hanna</u>		

**COMMENTS**

IDNR Form 542-1322

\*Omit if only measuring groundwater elevations.

**FORM FOR GROUNDWATER SAMPLING AND/OR GROUNDWATER ELEVATION MEASUREMENT**

Site Name	<u>Anderson Excavating</u>	Permit No.	<u>78-SDP-2-80C-CND</u>
MW/Piezometer No.	<u>MW-4</u>	Upgradient	<u>X</u>
		Downgradient	

Name of Person Sampling Kevin Hensley

**A. MONITORING WELL/PIEZOMETER CONDITIONS**

Well/Piezometer Capped?	<u>Yes</u>	Standing Water/Litter?	<u>No</u>
If NO, Explain	<u>  </u>		

**B. GROUNDWATER ELEVATION MEASUREMENT (+/- 0.01 foot, MSL)**

Top of Casing Elevation	<u>985.66</u>	feet	Ground Elevation (ft.)	<u>983.57</u>
Drilled Well Depth (ft.)	<u>58.4</u>	feet	Casing Dia. (in.)	<u>2.0</u>
Measured Well Depth (ft.)	<u>58.3</u>	feet		

Equipment Used	<u>Heron</u>			
----------------	--------------	--	--	--

Groundwater Level (+/- 0.01 foot below top of inner casing, MSL):

	Date	Time	Depth to Groundwater (ft)	Groundwater Elevation
Before Purging	<u>10/11/2006</u>	<u>10:35 AM</u>	<u>18.45</u>	<u>967.21</u>
After Purging	<u>  </u>	<u>  </u>	<u>19.20</u>	<u>966.46</u>
Before Sampling	<u>  </u>	<u>  </u>	<u>18.52</u>	<u>967.14</u>

**C. WELL PURGING**

Quantity of Water Removed from Well (gallons)	<u>20</u>
No. of Well Volumes (based on current water level)	<u>3.1</u>
Was well pumped/bailed dry?	<u>No</u>

Equipment Used:			
Bailer Type	<u>Not Used</u>	Dedicated Bailer?	<u>No</u>
Pump Type	<u>Waterra</u>	Dedicated Pump?	<u>Yes</u>

If not dedicated, method of cleaning   

**D. FIELD MEASUREMENTS\***

Weather Conditions	<u>40 degrees Fahrenheit, cloudy, 15- 20 mph winds</u>		
--------------------	--	--	--

Field Measurements (after stabilization):

Temperature	<u>13.1</u>	Units	<u>Celsius</u>
Equipment Used	<u>Hanna</u>		
pH	<u>7.07</u>	Units	<u>Standard Units</u>
Equipment Used	<u>Hanna</u>		
Spec.Conductance	<u>2,051</u>	Units	<u>uS/cm.</u>
Equipment Used	<u>Hanna</u>		

**COMMENTS**

IDNR Form 542-1322

\*Omit if only measuring groundwater elevations.

# FORM FOR GROUNDWATER SAMPLING AND/OR GROUNDWATER ELEVATION MEASUREMENT

Site Name	<u>Anderson Excavating</u>	Permit No.	<u>78-SDP-2-80C-CND</u>
MW/Piezometer No.	<u>MW-5</u>	Upgradient	
		Downgradient	<u>X</u>
Name of Person Sampling	<u>Kevin Hensley</u>		

## A. MONITORING WELL/PIEZOMETER CONDITIONS

Well/Piezometer Capped?	<u>Yes</u>	Standing Water/Litter?	<u>Yes</u>
If NO, Explain	<u>                  </u>		

## B. GROUNDWATER ELEVATION MEASUREMENT (+/- 0.01 foot, MSL)

Top of Casing Elevation	<u>985.15</u>	feet	Ground Elevation (ft.)	<u>982.85</u>
Drilled Well Depth (ft.)	<u>24.5</u>	feet	Casing Dia. (in.)	<u>2.0</u>
Measured Well Depth (ft.)	<u>23.7</u>	feet		

Equipment Used	<u>Heron</u>		
----------------	--------------	--	--

Groundwater Level (+/- 0.01 foot below top of inner casing, MSL):

	Date	Time	Depth to Groundwater (ft)	Groundwater Elevation
Before Purging	<u>10/11/2006</u>	<u>11:10 AM</u>	<u>18.25</u>	<u>966.90</u>
After Purging	<u>                  </u>	<u>                  </u>	<u>Dry</u>	<u>Dry</u>
Before Sampling	<u>                  </u>	<u>                  </u>	<u>20.80</u>	<u>964.35</u>

## C. WELL PURGING

Quantity of Water Removed from Well (gallons)	<u>2</u>
No. of Well Volumes (based on current water level)	<u>2.2</u>
Was well pumped/bailed dry?	<u>Yes</u>

Equipment Used:			
Bailer Type	<u>Not Used</u>	Dedicated Bailer?	<u>No</u>
Pump Type	<u>Waterra</u>	Dedicated Pump?	<u>Yes</u>

If not dedicated, method of cleaning \_\_\_\_\_

## D. FIELD MEASUREMENTS

Weather Conditions	<u>40 degrees Fahrenheit, cloudy, 15- 20 mph winds</u>		
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Field Measurements (after stabilization):

Temperature	<u>14.6</u>	Units	<u>Celsius</u>
Equipment Used	<u>Hanna</u>		
pH	<u>6.66</u>	Units	<u>Standard Units</u>
Equipment Used	<u>Hanna</u>		
Spec. Conductance	<u>2,617</u>	Units	<u>uS/cm.</u>
Equipment Used	<u>Hanna</u>		

COMMENTS	<u>8" of casing removed</u>		
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IDNR Form 542-1322

\*Omit if only measuring groundwater elevations.

**FORM FOR GROUNDWATER SAMPLING AND/OR GROUNDWATER ELEVATION MEASUREMENT**

Site Name	<u>Anderson Excavating</u>	Permit No.	<u>78-SDP-2-80C-CND</u>
MW/Piezometer No.	<u>MW-6</u>	Upgradient	<u>X</u>
		Downgradient	

Name of Person Sampling Kevin Hensley

**A. MONITORING WELL/PIEZOMETER CONDITIONS**

Well/Piezometer Capped?	<u>Yes</u>	Standing Water/Litter?	<u>Yes</u>
If NO, Explain		If YES, Explain	<u>litter</u>

**B. GROUNDWATER ELEVATION MEASUREMENT (+/- 0.01 foot, MSL)**

Top of Casing Elevation	<u>984.99</u>	feet	Ground Elevation (ft.)	<u>983.08</u>
Drilled Well Depth (ft.)	<u>57.4</u>	feet	Casing Dia. (in.)	<u>2.0</u>
Measured Well Depth (ft.)	<u>56.7</u>	feet		

Equipment Used Heron

Groundwater Level (+/- 0.01 foot below top of inner casing, MSL):

	Date	Time	Depth to Groundwater (ft)	Groundwater Elevation
Before Purging	<u>10/11/2006</u>	<u>11:30 AM</u>	<u>18.05</u>	<u>966.94</u>
After Purging			<u>18.50</u>	<u>966.49</u>
Before Sampling			<u>18.10</u>	<u>966.89</u>

**C. WELL PURGING\***

Quantity of Water Removed from Well (gallons)	<u>18</u>
No. of Well Volumes (based on current water level)	<u>2.9</u>
Was well pumped/bailed dry?	<u>No</u>

Equipment Used:

Bailer Type	<u>Not Used</u>	Dedicated Bailer?	<u>No</u>
Pump Type	<u>Waterra</u>	Dedicated Pump?	<u>Yes</u>

If not dedicated, method of cleaning

**D. FIELD MEASUREMENTS\***

Weather Conditions 40 degrees Fahrenheit, cloudy, 15- 20 mph winds

Field Measurements (after stabilization):

Temperature	<u>12.8</u>	Units	<u>Celsius</u>
Equipment Used	<u>Hanna</u>		
pH	<u>7.48</u>	Units	<u>Standard Units</u>
Equipment Used	<u>Hanna</u>		
Spec.Conductance	<u>2,289</u>	Units	<u>uS/cm.</u>
Equipment Used	<u>Hanna</u>		

COMMENTS 5.5" of casing removed

IDNR Form 542-1322

\*Omit if only measuring groundwater elevations.

# FORM FOR GROUNDWATER SAMPLING AND/OR GROUNDWATER ELEVATION MEASUREMENT

Site Name	<u>Anderson Excavating</u>	Permit No.	<u>78-SDP-2-80C-CND</u>
MW/Piezometer No.	<u>MW-7R</u>	Upgradient	<u>X</u>
		Downgradient	
Name of Person Sampling	<u>Kevin Hensley</u>		

## A. MONITORING WELL/PIEZOMETER CONDITIONS

Well/Piezometer Capped?	<u>Yes</u>	Standing Water/Litter?	<u>No</u>
If NO, Explain	<u> </u>		

## B. GROUNDWATER ELEVATION MEASUREMENT (+/- 0.01 foot, MSL)

Top of Casing Elevation	<u>986.13</u>	feet	Ground Elevation (ft.)	<u>983.22</u>
Drilled Well Depth (ft.)	<u>23.1</u>	feet	Casing Dia. (in.)	<u>2.0</u>
Measured Well Depth (ft.)	<u>23.1</u>	feet		

Equipment Used	<u>Heron</u>		
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Groundwater Level (+/- 0.01 foot below top of inner casing, MSL):

	Date	Time	Depth to Groundwater (ft)	Groundwater Elevation
Before Purging	<u>10/11/2006</u>	<u>12:05 PM</u>	<u>14.90</u>	<u>971.23</u>
After Purging	<u> </u>	<u> </u>	<u>Dry</u>	<u>Dry</u>
Before Sampling	<u> </u>	<u> </u>	<u>21.20</u>	<u>964.93</u>

## C. WELL PURGING\*

Quantity of Water Removed from Well (gallons)	<u>4</u>
No. of Well Volumes (based on current water level)	<u>3.0</u>
Was well pumped/bailed dry?	<u>Yes</u>

Equipment Used:			
Bailer Type	<u>Bailer</u>	Dedicated Bailer?	<u>No</u>
Pump Type	<u>Not Used</u>	Dedicated Pump?	<u>No</u>

If not dedicated, method of cleaning \_\_\_\_\_

## D. FIELD MEASUREMENTS\*

Weather Conditions	<u>40 degrees Fahrenheit, cloudy, 15- 20 mph winds</u>		
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Field Measurements (after stabilization):

Temperature	<u>13.9</u>	Units	<u>Celsius</u>
Equipment Used	<u>Hanna</u>		
pH	<u>6.93</u>	Units	<u>Standard Units</u>
Equipment Used	<u>Hanna</u>		
Spec.Conductance	<u>2,418</u>	Units	<u>uS/cm.</u>
Equipment Used	<u>Hanna</u>		

COMMENTS	<u> </u>		
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IDNR Form 542-1322

\*Omit if only measuring groundwater elevations.

**FORM FOR GROUNDWATER SAMPLING AND/OR GROUNDWATER ELEVATION MEASUREMENT**

Site Name	<u>Anderson Excavating</u>	Permit No.	<u>78-SDP-2-80C-CND</u>
MW/Piezometer No.	<u>MW-8</u>	Upgradient	
		Downgradient	<u>X</u>

Name of Person Sampling Kevin Hensley

**A. MONITORING WELL/PIEZOMETER CONDITIONS**

Well/Piezometer Capped?	<u>Yes</u>	Standing Water/Litter?	<u>No</u>
If NO, Explain	<u>                  </u>		

**B. GROUNDWATER ELEVATION MEASUREMENT (+/- 0.01 foot, MSL)**

Top of Casing Elevation	<u>982.05</u>	feet	Ground Elevation (ft.)	<u>979.05</u>
Drilled Well Depth (ft.)	<u>56.9</u>	feet	Casing Dia. (in.)	<u>2.0</u>
Measured Well Depth (ft.)	<u>56.5</u>	feet		

Equipment Used Heron

Groundwater Level (+/- 0.01 foot below top of inner casing, MSL):

	Date	Time	Depth to Groundwater (ft)	Groundwater Elevation
Before Purging	<u>10/11/2006</u>	<u>9:45 AM</u>	<u>16.80</u>	<u>965.25</u>
After Purging	<u>                  </u>	<u>                  </u>	<u>17.00</u>	<u>965.05</u>
Before Sampling	<u>                  </u>	<u>                  </u>	<u>16.80</u>	<u>965.25</u>

**C. WELL PURGING\***

Quantity of Water Removed from Well (gallons)	<u>20</u>
No. of Well Volumes (based on current water level)	<u>3.1</u>
Was well pumped/bailed dry?	<u>No</u>

Equipment Used:			
Bailer Type	<u>Not Used</u>	Dedicated Bailer?	<u>No</u>
Pump Type	<u>Waterra</u>	Dedicated Pump?	<u>Yes</u>

If not dedicated, method of cleaning                   

**D. FIELD MEASUREMENTS\***

Weather Conditions 40 degrees Fahrenheit, cloudy, 15- 20 mph winds

Field Measurements (after stabilization):

Temperature	<u>12.9</u>	Units	<u>Celsius</u>
Equipment Used	<u>Hanna</u>		
pH	<u>7.01</u>	Units	<u>Standard Units</u>
Equipment Used	<u>Hanna</u>		
Spec.Conductance	<u>2,394</u>	Units	<u>uS/cm.</u>
Equipment Used	<u>Hanna</u>		

COMMENTS                   

IDNR Form 542-1322

\*Omit if only measuring groundwater elevations.

# FORM FOR SURFACE WATER SAMPLING

Site Name	<u>Anderson Excavating</u>	Permit No.	<u>78-SDP-2-80C-CND</u>
Surface Monitoring Point No.	<u>SW-1</u>	Date	<u>10/11/2006</u>

Name of Person Sampling Kevin Hensley

## A. TYPE OF MONITORING POINT

Stream	<u>                  </u>	Open Tile	<u>                  </u>
Road Ditch	<u>                  </u>	Tile with Riser	<u>                  </u>
Drainage Ditch	<u>X</u>	Other	<u>                  </u>

## B. PURPOSE OF MONITORING POINT

Upstream	<u>                  </u> feet	Downstream	<u>X</u>
Within Landfill	<u>                  </u> feet	Other	<u>                  </u>

## C. MONITORING POINT CONDITIONS

General description/condition of monitoring point

Surface water drainage ditch along south portion of the site.

Was monitoring point dry?	<u>Yes</u>	Too little water to sample?	<u>Yes</u>
Was water flowing?	<u>No</u>	If yes, estimate quantity	<u>NA</u>
		If yes, estimate depth	<u>NA</u>

Was water discolored?	<u>NA</u>
Does water have odor?	<u>NA</u>
Was ground discolored?	<u>No</u>
Litter present?	<u>No</u>

Comments

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## D. FIELD MEASUREMENTS\*

Weather Conditions 40 degrees Fahrenheit, cloudy, 15- 20 mph winds

Field Measurements (after stabilization):

Temperature	<u>NM</u>	Units	<u>Celsius</u>
Equipment Used	<u>Hanna</u>		
pH	<u>NM</u>	Units	<u>Standard units</u>
Equipment Used	<u>Hanna</u>		
Spec. Conductance	<u>NM</u>	Units	<u>uS/cm.</u>
Equipment Used	<u>Hanna</u>		

COMMENTS Dry

IDNR Form 542-1324

\*Omit if only measuring groundwater elevations.

**APPENDIX B**  
**SUMMARY OF GROUNDWATER CHEMISTRY**



## Summary of Groundwater Chemistry

Carter Lake Construction and Demolition Landfill - 78-SDP-02-80C

Parameter	Date	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-7R	MW-8
		DN1	UP2	DN1	UP2	DN1	UP2	UP1	UP1	DN2
Chemical Oxygen Demand - mg/L	10/2/1996	70.0	19.0	45.0	29.0	48.0	130	120	NM	46.0
	1/27/1997	62.0	15.0	54.0	33.0	76.0	150	120	NM	46.0
	4/15/1997	94.0	8.70	60.0	40.0	55.0	110	100	NM	33.0
	7/23/1997	58.0	6.80	85.0	18.0	47.0	100	110	NM	63.0
	10/15/1997	64.0	57.0	45.0	15.0	31.0	110	120	NM	55.0
	4/6/1998	110	44.0	48.0	17.0	62.0	52.0	77.0	NM	110
	10/13/1998	91.0	50.0	150	27.0	92.0	66.0	100	NM	100
	4/15/1999	89.0	NM	66.0	21.0	42.0	51.0	NM	NM	98.0
	10/7/1999	80.0	NM	49.0	22.0	69.0	89.0	NM	NM	110
	10/12/2000	56.0	NM	30.0	19.0	76.0	50.0	NM	NM	54.0
	10/4/2001	41.0	NM	NM	39.0	109	67.0	NM	85.0	40.0
	10/3/2002	51.0	NM	28.0	31.0	86.0	144	NM	100	28.0
	10/15/2003	120	NM	36.0	24.0	96.0	180	NM	100	30.0
	10/4/2004	53.0	NM	31.0	8.10	150	140	NM	69.0	18.0
	10/10/2005	140	NM	36.0	24.0	140	120	NM	95.0	32.0
	10/11/2006	308	NM	29.6	24.3	82.0	101	NM	111	31.1
Chloride - mg/L	10/2/1996	160	31.0	160	69.0	64.0	180	94.0	NM	86.0
	1/27/1997	150	36.0	140	65.0	85.0	140	63.0	NM	83.0
	4/15/1997	120	34.0	150	70.0	62.0	150	64.0	NM	84.0
	7/23/1997	140	36.0	120	61.0	60.0	150	110	NM	130
	10/15/1997	130	88.0	880	57.0	54.0	120	86.0	NM	76.0
	4/6/1998	110	70.0	78.0	62.0	50.0	75.0	89.0	NM	210
	10/13/1998	110	84.0	100	70.0	92.0	96.0	160	NM	160
	4/15/1999	48.0	NM	64.0	70.0	16.0	81.0	NM	NM	160
	10/7/1999	160	NM	130	70.0	99.0	140	NM	NM	160
	10/12/2000	244	NM	120	62.0	100	100	NM	NM	112
	10/4/2001	221	NM	NM	98.0	72.0	118	NM	57.0	112
	10/3/2002	215	NM	97.0	61.0	75.0	166	NM	50.0	63.0
	10/15/2003	243	NM	141	46.9	75.3	219	NM	56.3	74.1
	10/4/2004	97.2	NM	169	47.0	52.4	196	NM	48.9	88.2
	10/10/2005	143	NM	132	67.1	61.4	186	NM	51.4	56.4
	10/11/2006	84.7	NM	144	67.1	56.3	172	NM	66.2	49.8

## Summary of Groundwater Chemistry



Carter Lake Construction and Demolition Lender - 78-SDP-02-00C

Iron, Dissolved - mg/L

Parameter	Date	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-7R	MW-8
Iron, Dissolved - mg/L	10/27/1996	21.0	14.0	18.0	30.0	46.0	36.0	5.50	NM	30.0
10/27/1997	22.0	14.0	14.0	21.0	32.0	75.0	34.0	6.90	NM	27.0
4/15/1997	34.0	26.0	24.0	36.0	52.0	32.0	8.20	NM	30.0	
7/23/1997	21.0	13.0	62.0	27.0	53.0	30.0	11.0	NM	41.0	
4/6/1997	27.0	40.0	36.0	29.0	42.0	36.0	17.0	NM	42.0	
4/6/1998	44.0	27.0	27.0	25.0	29.0	24.0	27.0	28.0	NM	49.0
10/13/1998	19.0	18.0	29.0	26.0	50.0	22.0	22.0	NM	NM	50.0
4/15/1999	11.0	11.0	NM	8.00	28.0	<0.1000	22.0	NM	NM	43.0
10/7/1999	30.0	NM	28.0	33.0	20.0	29.0	20.0	NM	NM	50.0
10/12/2000	24.5	NM	26.9	27.6	20.5	20.9	NM	NM	NM	35.5
10/12/2000	24.0	NM	26.0	27.0	25.0	27.0	NM	NM	NM	27.6
10/4/2001	21.4	NM	25.1	33.8	23.4	23.4	NM	15.3	10.3	36.3
10/3/2002	15.8	NM	1.02	25.7	20.7	34.3	NM	10.3		
10/15/2003	1.76	NM	0.1000	21.6	3.12	0.1300	NM	11.3	<0.1000	
10/4/2004	17.0	NM	0.4100	24.0	38.0	31.0	NM	32.0	40.0	
10/10/2005	11.0	NM	1.10	28.0	15.0	32.0	NM	34.0	39.0	
10/1/2006	2.44	NM	0.4230	29.0	9.08	29.4	NM	38.4	35.6	
10/2/1996	0.5800	12.0	0.3500	2.70	1.20	3.00	2.00	NM	2.70	
1/27/1997	0.5400	1.00	<0.2000	2.30	0.6600	3.40	1.20	NM	1.90	
4/15/1997	0.5400	1.00	0.3500	2.70	1.20	3.00	2.00	NM	2.70	
10/2/1996	0.5800	12.0	0.3500	2.70	1.20	3.00	2.00	NM	2.70	
4/15/1997	1.70	1.30	2.00	2.50	0.5400	3.20	2.00	NM	2.40	
7/23/1997	1.10	1.30	2.00	2.50	0.5400	3.20	2.00	NM	2.40	
4/6/1998	3.00	3.90	0.9800	2.40	0.6400	2.60	1.60	NM	2.30	
10/3/1998	1.60	2.90	1.10	2.90	0.6300	3.30	3.20	NM	2.50	
4/6/1999	1.50	NM	0.2200	3.10	<0.2000	3.40	2.00	NM	1.90	
10/7/1999	3.60	NM	0.7900	3.20	0.7300	3.00	NM	NM	2.70	
4/15/1999	1.50	NM	0.2200	3.10	0.4900	6.51	NM	2.64	2.30	
10/4/2004	3.19	NM	<0.2000	2.05	0.5000	4.23	NM	1.98	1.98	
10/1/2005	3.44	NM	<0.2000	2.57	<0.2000	5.62	NM	5.13	2.29	
10/1/2005	3.44	NM	<0.2000	2.60	0.4900	6.51	NM	2.64	2.30	
10/1/2006	8.38	NM	<0.2000	2.61	<0.2000	5.02	NM	5.53	2.37	

Nitrogen, Ammonia - mg/L  
HAL - 30 mg/L



## Summary of Groundwater Chemistry

Carter Lake Construction and Demolition Landfill - 78-SDP-02-80C

Parameter	Date	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-7R	MW-8
		DN1	UP2	DN1	UP2	DN1	UP2	UP1	UP1	DN2
pH - S.U.	10/2/1996	7.10	7.37	7.03	7.24	7.75	7.80	8.10	NM	7.20
	1/27/1997	6.87	7.38	7.10	6.98	6.84	6.86	7.48	NM	6.73
	4/15/1997	7.46	7.49	7.75	7.17	7.34	7.20	7.32	NM	7.55
	7/23/1997	6.55	6.99	7.62	6.95	7.07	6.98	7.12	NM	7.38
	10/15/1997	7.07	7.15	6.94	6.83	7.27	7.05	6.99	NM	7.01
	4/6/1998	7.27	7.38	7.05	6.97	7.44	6.92	7.08	NM	7.13
	10/13/1998	7.11	7.20	7.04	6.80	7.33	6.89	7.12	NM	7.30
	4/15/1999	6.23	NM	6.84	6.56	6.71	6.23	NM	NM	6.12
	10/7/1999	5.51	NM	5.72	5.73	6.26	5.74	NM	NM	5.16
	10/12/2000	5.45	NM	5.79	5.37	5.82	5.67	NM	NM	5.53
	10/4/2001	5.67	NM	NM	7.02	5.65	6.73	NM	5.21	6.85
	10/3/2002	6.71	NM	6.89	6.93	6.68	6.94	NM	6.99	6.91
	10/15/2003	6.18	NM	6.78	6.39	6.48	6.69	NM	6.30	6.29
	10/4/2004	7.27	NM	7.27	7.25	6.74	7.20	NM	6.74	7.02
	10/10/2005	7.00	NM	7.09	7.13	6.64	7.10	NM	6.80	7.00
	10/11/2006	6.89	NM	6.58	7.07	6.66	7.48	NM	6.93	7.01
Specific Conductance - umhos/cm	1/27/1997	1,670	1,410	1,380	1,930	2,950	2,130	2,480	NM	2,190
	4/15/1997	3,600	2,220	3,340	3,230	3,170	2,350	3,100	NM	2,820
	7/23/1997	1,990	2,820	3,090	3,180	2,820	2,730	2,640	NM	2,900
	10/15/1997	2,760	3,440	3,220	2,320	2,020	2,200	3,110	NM	2,760
	4/6/1998	2,630	3,060	3,090	2,420	1,880	1,950	3,240	NM	2,520
	10/13/1998	1,710	3,500	3,360	2,480	1,960	2,020	3,240	NM	2,610
	4/15/1999	2,360	NM	2,940	2,500	1,540	1,940	NM	NM	3,030
	10/7/1999	1,350	NM	1,900	1,240	1,460	960	NM	NM	1,750
	10/12/2000	2,090	NM	2,680	2,190	2,480	1,520	NM	NM	2,030
	10/4/2001	1,520	NM	NM	1,290	1,480	1,080	NM	1,280	1,280
	10/3/2002	1,625	NM	1,578	1,458	1,941	1,787	NM	1,760	1,547
	10/15/2003	1,259	NM	740	981	814	776	NM	785	1,166
	10/4/2004	1,163	NM	1,056	880	1,123	968	NM	1,102	1,350
	10/10/2005	1,313	NM	1,212	1,108	1,456	1,188	NM	1,210	1,577
	10/11/2006	2,537	NM	2,118	2,051	2,617	2,289	NM	2,418	2,394



## Summary of Groundwater Chemistry

CARLISLE CONSTRUCTION AND DEMOLITION LANDFILL - T8-SPP-A2-80C  
ENGINEERING CONSULTANTS  
SAKEM

Parameter	Date	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	
		DN1	UP2	DN1	UP2	DN1	UP2	UP1	UP1	DN2
<b>Total Organic Halogens - mg/L</b>										
10/21/1996	0.0300	<0.0100	0.0460	0.0140	0.0460	0.0140	0.0440	0.0100	0.0210	NM
10/15/1997	0.0300	0.0230	0.0430	0.0240	0.0110	0.0620	0.0370	0.0390	NM	0.0270
10/7/1999	0.0600	0.0140	0.0460	0.0140	0.0460	0.0140	0.0440	0.0100	0.0210	NM
10/13/1998	0.0339	NM	0.0542	0.0123	0.0450	0.0123	0.0403	0.0226	NM	NM
10/4/2000	0.0100	NM	0.1130	NM	0.0970	0.0260	0.0450	0.0100	0.0110	NM
10/3/2002	0.0266	NM	0.1000	NM	0.0920	0.0200	0.0920	0.0100	0.0100	NM
10/4/2001	0.0240	NM	0.0970	NM	0.0220	0.0100	0.0100	0.0100	0.0100	NM
10/15/2003	0.0200	NM	0.0320	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	NM
10/4/2004	0.0770	NM	0.0240	0.0150	0.0150	0.0100	0.0100	0.0120	NM	0.0210
10/10/2005	0.0770	NM	0.0240	0.0140	0.0140	0.0100	0.0100	0.0120	NM	0.0390
10/15/1997	0.5450	0.2020	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	NM
10/13/1998	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	NM
10/7/1999	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	0.0200	NM
10/12/2000	0.1000	NM	0.1000	NM	0.1000	0.1000	0.1000	0.1000	0.1000	NM
10/4/2001	0.1000	NM	0.1000	NM	0.1000	0.1000	0.1000	0.1000	0.1000	NM
10/3/2002	0.1000	NM	0.1000	NM	0.1000	0.1000	0.1000	0.1000	0.1000	NM
10/4/2004	0.2000	NM	0.2000	NM	0.2000	0.2000	0.2000	0.2000	0.2000	NM
10/10/2005	0.2000	NM	0.2000	NM	0.2000	0.2000	0.2000	0.2000	0.2000	NM
10/15/1997	0.0195	0.0239	0.0270	0.0145	0.0596	0.0752	0.0042	NM	0.0133	NM
7/23/1997	0.0281	<0.0001	0.0387	0.0339	0.0133	0.0745	0.0011	NM	0.0168	NM
4/15/1999	NM	NM	0.0118	NM	0.0010	0.0492	NM	NM	0.0148	NM
10/13/1998	NM	NM	0.0307	NM	0.0484	0.0607	NM	NM	0.0157	NM
4/6/1998	NM	NM	0.025	NM	0.0080	0.0352	NM	NM	0.0090	NM
10/15/1997	0.0332	0.0120	0.0354	0.0269	0.0140	0.0682	0.0035	NM	0.0141	NM
10/1/1997	NM	NM	0.0086	NM	0.0264	0.0673	NM	NM	0.0175	NM
10/7/1999	NM	NM	0.0110	NM	0.0010	0.0492	NM	NM	0.0160	NM
10/1/2000	NM	NM	0.0260	NM	0.0200	0.0670	NM	NM	0.0160	NM
10/3/2002	0.0110	NM	NM	<0.0010	0.0260	0.0600	0.0220	NM	0.0160	NM
10/4/2004	0.0124	NM	0.0027	0.0216	0.0150	0.0678	0.0159	NM	0.0204	0.0170
10/10/2005	0.0318	NM	0.0096	0.0400	0.0085	0.0609	NM	NM	0.0275	0.0171
10/1/2006	0.0084	NM	0.0028	0.0446	0.0219	0.0643	NM	NM	0.0545	0.0181

Arsenic, Dissolved - mg/L

Total Phenols - mg/L

MCL - 0.01 mg/L

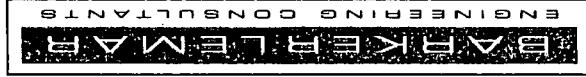


## Summary of Groundwater Chemistry

Carter Lake Construction and Demolition Landfill - 78-SDP-02-80C

Parameter	Date	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-7R	MW-8
		DN1	UP2	DN1	UP2	DN1	UP2	UP1	UP1	DN2
Benzene - ug/L MCL - 5 ug/L NRL - 1 ug/L	10/2/1996	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NM	<1.0
	1/27/1997	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NM	<0.5
	4/15/1997	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NM	<0.5
	7/23/1997	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NM	<0.5
Carbon Tetrachloride - ug/L MCL - 5 ug/L NRL - 0.3 ug/L	10/2/1996	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NM	<1.0
	1/27/1997	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	NM	<0.3
	4/15/1997	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	NM	<0.3
	7/23/1997	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.6	NM	<0.3
1,4-Dichlorobenzene - ug/L MCL - 75 ug/L HAL - 75 ug/L	10/2/1996	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NM	<1.0
	1/27/1997	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NM	<1.0
	4/15/1997	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NM	<1.0
	7/23/1997	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	NM	<1.0
1,2-Dichloroethane - ug/L MCL - 5 ug/L NRL - 0.4 ug/L	10/2/1996	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NM	<1.0
	1/27/1997	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	NM	<0.4
	4/15/1997	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	NM	<0.4
	7/23/1997	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.8	NM	<0.4
1,1-Dichloroethene - ug/L	10/2/1996	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NM	<1.0
	1/27/1997	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	NM	<2.0
	4/15/1997	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	NM	<2.0
	7/23/1997	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<4.0	NM	<2.0
1,1,1-Trichloroethane - ug/L MCL - 200 ug/L HAL - 200 ug/L	10/2/1996	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NM	<1.0
	1/27/1997	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NM	<1.0
	4/15/1997	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NM	<1.0
	7/23/1997	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	NM	<1.0
Trichloroethylene - ug/L MCL - 5 ug/L NRL - 3 ug/L	10/2/1996	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NM	<1.0
	1/27/1997	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NM	<1.0
	4/15/1997	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NM	<1.0
	7/23/1997	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0	NM	<1.0
Barium, Dissolved - mg/L MCL - 2 mg/L HAL - 2 mg/L	10/2/1996	0.0750	0.3280	0.0480	0.1700	0.0460	1.00	0.6810	NM	0.2300
	1/27/1997	0.0740	0.3180	0.0460	0.2020	0.0520	1.10	0.6200	NM	0.2100
	4/15/1997	0.1730	0.1340	0.0640	0.2180	0.0480	0.9534	0.3730	NM	0.2100
	7/23/1997	0.0910	0.3320	0.0730	0.1810	0.0440	0.8970	0.6780	NM	0.1700
Cadmium, Dissolved - mg/L MCL - 0.005 mg/L HAL - 0.005 mg/L	10/2/1996	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NM	<0.0005
	1/27/1997	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NM	<0.0005
	4/15/1997	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NM	<0.0005
	7/23/1997	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NM	<0.0005

## Summary of Groundwater Chemistry



Carter Lake Construction and Demolition Landfill - 78-SDP-02-80C

Parameter	Date	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-7R	MW-8
Chromium, Dissolved - mg/L	10/2/1996	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Chromium, Dissolved - mg/L	1/27/1997	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Chromium, Dissolved - mg/L	4/15/1997	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Copper, Dissolved - mg/L	10/2/1996	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Copper, Dissolved - mg/L	7/23/1997	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Copper, Dissolved - mg/L	4/15/1997	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Lead, Dissolved - mg/L	10/2/1996	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Lead, Dissolved - mg/L	7/23/1997	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Lead, Dissolved - mg/L	1/27/1997	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium, Dissolved - mg/L	10/2/1996	140	70.0	130	100	140	110	150	NM	130
Magnesium, Dissolved - mg/L	7/23/1997	120	64.0	210	94.0	190	92.0	140	NM	130
Magnesium, Dissolved - mg/L	4/15/1997	150	130	200	130	210	98.0	92.0	NM	140
Magnesium, Dissolved - mg/L	1/27/1997	130	67.0	120	120	110	110	140	NM	120
Mercury, Dissolved - mg/L	10/2/1996	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	0.0003	0.0002	NM	<0.0002
Mercury, Dissolved - mg/L	7/23/1997	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.0002	0.0002	NM	<0.0002
Mercury, Dissolved - mg/L	4/15/1997	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.0002	0.0002	NM	<0.0002
Mercury, Dissolved - mg/L	1/27/1997	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.0002	0.0002	NM	<0.0002
Zinc, Dissolved - mg/L	10/2/1996	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	NM	<0.0200
Zinc, Dissolved - mg/L	7/23/1997	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	NM	<0.0200
Zinc, Dissolved - mg/L	4/15/1997	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	NM	<0.0200
Zinc, Dissolved - mg/L	1/27/1997	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	<0.0200	NM	<0.0200
Notes:										

Sampling performed over multiple dates is recorded on the first date sampled. Refer to field forms for exact date.

USEPA MCL - indicates United States Environmental Protection Agency Maximum Contaminant Level  
 USEPA NRL - indicates United States Environmental Protection Agency Negligible Risk Level for Carcinogens  
 USEPA HAL - indicates United States Environmental Protection Agency Health Advisory Level  
 mg/L - indicates milligrams per liter, equivalent to parts per billion at low concentrations  
 ug/L - indicates micrograms per filter, equivalent to parts per billion at low concentrations  
 < - indicates less than the Method Detection Limit (MDL)  
 NM - indicates parameter was not measured

**APPENDIX C**  
**FALL ANALYTICAL DATA**

October 30, 2006

Client:

BARKER, LEMAR & ASSOCIATES  
1801 Industrial Circle  
West Des Moines, IA 50265

Work Order: CPJ0968  
Project Name: AE&W Closed Carter Lake-C&D Landfill  
Project Number: ANDEX 06101

Attn: Yuta Naganuma

Date Received: 10/13/06

An executed copy of the chain of custody is also included as an addendum to this report

If you have any questions relating to this analytical report please contact your Laboratory Project Manager at 1-(800)750-2401

SAMPLE IDENTIFICATION	LAB NUMBER	COLLECTION DATE AND TIME
MW-1	CPJ0968-01	10/11/06 09:30
MW-3	CPJ0968-02	10/11/06 10:15
MW-4	CPJ0968-03	10/11/06 10:35
MW-5	CPJ0968-04	10/11/06 11:10
MW-6	CPJ0968-05	10/11/06 11:30
MW-7R	CPJ0968-06	10/11/06 12:05
MW-8	CPJ0968-07	10/11/06 09:45

Samples were received into laboratory at a temperature of 3 °C.

Most environmental analytical testing methods require a sample temperature of 4 degrees C +/- 2 degrees C for preservation of the sample constituents prior to analysis. If sample temperatures are outside of this temperature range at the time of sample receipt results may be impacted. Please refer to the Temperature and Sample Receipt form that is included with this report for additional information regarding the condition of samples at the time of receipt by the laboratory.

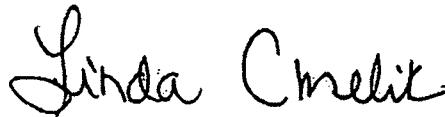
The reported results were obtained in compliance with the 2003 NELAC standards unless otherwise noted.

Iowa Certification Number: 007

*Reproduction of this analytical report is permitted only in its entirety. This report shall not be reproduced except in full without the written approval of the laboratory.*

*TestAmerica Analytical Testing Corporation certifies that the analytical results contained herein apply only to the specific sample analyzed.*

Approved By:



TestAmerica - Cedar Falls, IA

Linda Cmelik

Project Coordinator

BARKER, LEMAR & ASSOCIATES  
 1801 Industrial Circle  
 West Des Moines, IA 50265  
 Yuta Naganuma

Work Order: CPJ0968 Received: 10/13/06  
 Project: AE&W Closed Carter Lake-C&D Landfill Reported: 10/30/06 08:09  
 Project Number: ANDEX 06101

## ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Quan. Limit	Dilution Factor	Date Analyzed	Analyst	Seq/Batch	Method
<b>Sample ID: CPJ0968-01 (MW-1 - Ground Water)</b>									
General Chemistry Parameters									
Ammonia as N	8.38		mg/L	0.200	1	10/27/06 11:26	lbb	6101430	EPA 350.1
Chemical Oxygen Demand	308		mg/L	25.0	5	10/26/06 11:27	jcf	6101399	SM 5220D
Chloride	84.7		mg/L	5.00	1	10/24/06 10:02	lbb	6101185	SM 4500Cl E
Phenol	<0.0200		mg/L	0.0200	1	10/26/06 10:51	mdk	6101327	EPA 420.2
Total Organic Halides	0.758	S7	mg/L Cl-	0.0100	1	10/23/06 14:20	sas	6101263	SW 9020
Dissolved Metals by SW 846 Series Methods									
Arsenic	0.00844		mg/L	0.00100	1	10/19/06 19:45	evb	6100931	SW 7060A
Iron	2.44		mg/L	0.100	1	10/19/06 14:05	llw	6100935	SW 6010B
<b>Sample ID: CPJ0968-02 (MW-3 - Ground Water)</b>									
General Chemistry Parameters									
Ammonia as N	<0.200		mg/L	0.200	1	10/27/06 11:27	lbb	6101430	EPA 350.1
Chemical Oxygen Demand	29.6		mg/L	5.00	1	10/26/06 11:27	jcf	6101399	SM 5220D
Chloride	144		mg/L	5.00	1	10/24/06 10:07	lbb	6101185	SM 4500Cl E
Phenol	<0.0200		mg/L	0.0200	0.976	10/26/06 10:59	mdk	6101327	EPA 420.2
Total Organic Halides	0.0176		mg/L Cl-	0.0100	1	10/20/06 14:20	jmh	6101263	SW 9020
Dissolved Metals by SW 846 Series Methods									
Arsenic	0.00277		mg/L	0.00100	1	10/18/06 13:06	heh	6100899	SW 7060A
Iron	0.423		mg/L	0.100	1	10/29/06 01:11	llw	6101465	SW 6010B
<b>Sample ID: CPJ0968-03 (MW-4 - Ground Water)</b>									
General Chemistry Parameters									
Ammonia as N	2.61		mg/L	0.200	1	10/27/06 11:27	lbb	6101430	EPA 350.1
Chemical Oxygen Demand	24.3		mg/L	5.00	1	10/26/06 11:27	jcf	6101399	SM 5220D
Chloride	67.1		mg/L	5.00	1	10/24/06 10:08	lbb	6101185	SM 4500Cl E
Phenol	<0.0200		mg/L	0.0200	0.96	10/26/06 11:27	mdk	6101327	EPA 420.2
Total Organic Halides	0.0375		mg/L Cl-	0.0100	1	10/23/06 14:20	sas	6101263	SW 9020
Dissolved Metals by SW 846 Series Methods									
Arsenic	0.0446		mg/L	0.00100	1	10/18/06 13:13	heh	6100899	SW 7060A
Iron	29.0		mg/L	0.100	1	10/29/06 01:16	llw	6101465	SW 6010B
<b>Sample ID: CPJ0968-04 (MW-5 - Ground Water)</b>									
General Chemistry Parameters									
Ammonia as N	<0.200		mg/L	0.200	1	10/27/06 11:28	lbb	6101430	EPA 350.1
Chemical Oxygen Demand	82.0		mg/L	5.00	1	10/26/06 11:27	jcf	6101399	SM 5220D
Chloride	56.3		mg/L	5.00	1	10/24/06 10:08	lbb	6101185	SM 4500Cl E
Phenol	<0.0200		mg/L	0.0200	0.96	10/26/06 11:28	mdk	6101327	EPA 420.2
Total Organic Halides	0.213	S7	mg/L Cl-	0.0100	1	10/24/06 14:20	sas	6101263	SW 9020
Dissolved Metals by SW 846 Series Methods									
Arsenic	0.0219		mg/L	0.00100	1	10/18/06 13:16	heh	6100899	SW 7060A
Iron	9.08		mg/L	0.100	1	10/29/06 01:21	llw	6101465	SW 6010B
<b>Sample ID: CPJ0968-05 (MW-6 - Ground Water)</b>									
General Chemistry Parameters									
Ammonia as N	5.02		mg/L	0.200	1	10/27/06 11:29	lbb	6101430	EPA 350.1
Chemical Oxygen Demand	101		mg/L	5.00	1	10/26/06 11:27	jcf	6101399	SM 5220D

BARKER, LEMAR & ASSOCIATES  
 1801 Industrial Circle  
 West Des Moines, IA 50265  
 Yuta Naganuma

Work Order: CPJ0968 Received: 10/13/06  
 Project: AE&W Closed Carter Lake-C&D Landfill Reported: 10/30/06 08:09  
 Project Number: ANDEX 06101

## ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Quan.	Limit	Dilution Factor	Date Analyzed	Analyst	Seq/Batch	Method
<b>Sample ID: CPJ0968-05 (MW-6 - Ground Water) - cont.</b>										
General Chemistry Parameters - cont.										
Chloride	172		mg/L	5.00	1	10/24/06 10:09	lbb	6101185	SM 4500Cl E	
Phenol	<0.0200		mg/L	0.0200	1	10/26/06 11:52	mdk	6101339	EPA 420.2	
Total Organic Halides	0.0187		mg/L Cl-	0.0100	1	10/24/06 14:20	sas	6101263	SW 9020	
Dissolved Metals by SW 846 Series Methods										
Arsenic	0.0643		mg/L	0.00100	1	10/18/06 13:23	heh	6100899	SW 7060A	
Iron	29.4		mg/L	0.100	1	10/29/06 01:42	llw	6101465	SW 6010B	
<b>Sample ID: CPJ0968-06 (MW-7R - Ground Water)</b>										
General Chemistry Parameters										
Ammonia as N	5.53		mg/L	0.200	1	10/27/06 11:30	lbb	6101430	EPA 350.1	
Chemical Oxygen Demand	111		mg/L	5.00	1	10/26/06 11:27	jcf	6101399	SM 5220D	
Chloride	66.2		mg/L	5.00	1	10/24/06 10:10	lbb	6101185	SM 4500Cl E	
Phenol	<0.0200		mg/L	0.0200	0.984	10/26/06 10:51	mdk	6101327	EPA 420.2	
Total Organic Halides	0.0197		mg/L Cl-	0.0100	1	10/23/06 14:20	jmh	6101263	SW 9020	
Dissolved Metals by SW 846 Series Methods										
Arsenic	0.0545		mg/L	0.00100	1	10/18/06 13:30	heh	6100899	SW 7060A	
Iron	38.4		mg/L	0.100	1	10/29/06 01:47	llw	6101465	SW 6010B	
<b>Sample ID: CPJ0968-07 (MW-8 - Ground Water)</b>										
General Chemistry Parameters										
Ammonia as N	2.37		mg/L	0.200	1	10/27/06 11:31	lbb	6101430	EPA 350.1	
Chemical Oxygen Demand	31.1		mg/L	5.00	1	10/26/06 11:27	jcf	6101399	SM 5220D	
Chloride	49.8		mg/L	5.00	1	10/24/06 10:10	lbb	6101185	SM 4500Cl E	
Phenol	<0.0200		mg/L	0.0200	0.98	10/26/06 11:26	mdk	6101337	EPA 420.2	
Total Organic Halides	0.0187		mg/L Cl-	0.0100	1	10/23/06 14:20	jmh	6101263	SW 9020	
Dissolved Metals by SW 846 Series Methods										
Arsenic	0.0181		mg/L	0.00100	1	10/18/06 13:41	heh	6100899	SW 7060A	
Iron	35.6		mg/L	0.100	1	10/29/06 01:53	llw	6101465	SW 6010B	

BARKER, LEMAR & ASSOCIATES  
 1801 Industrial Circle  
 West Des Moines, IA 50265  
 Yuta Naganuma

Work Order: CPJ0968

Received: 10/13/06

Reported: 10/30/06 08:09

Project: AE&W Closed Carter Lake-C&D Landfill  
 Project Number: ANDEX 06101

## LABORATORY BLANK QC DATA

Analyte	Seq/ Batch	Source Result	Spike Level	Units	MDL	MRL	Dup Result	% REC	Dup Result	% REC	RPD Limits	RPD Limit	Q
<b>General Chemistry Parameters</b>													
Chloride	6101185			mg/L	N/A	5.00	<5.00						
Total Organic Halides	6101263			mg/L Cl-	N/A	0.0100	<0.0100						
Phenol	6101327			mg/L	N/A	0.0200	<0.0200						
Phenol	6101327			mg/L	N/A	0.0200	<0.0200						
Phenol	6101337			mg/L	N/A	0.0200	<0.0200						
Phenol	6101339			mg/L	N/A	0.0200	<0.0200						
Chemical Oxygen Demand	6101399			mg/L	N/A	5.00	<5.00						
Ammonia as N	6101430			mg/L	N/A	0.200	<0.200						
<b>Dissolved Metals by SW 846 Series Methods</b>													
Arsenic	6100899			mg/L	N/A	0.00100	<0.00100						
Arsenic	6100931			mg/L	N/A	0.00100	<0.00100						
Iron	6100935			mg/L	N/A	0.100	<0.100						
Iron	6101465			mg/L	N/A	0.100	<0.100						

BARKER, LEMAR & ASSOCIATES  
1801 Industrial Circle  
West Des Moines, IA 50265  
Yuta Naganuma

Work Order: CPJ0968

Received: 10/13/06

Reported: 10/30/06 08:09

Project: AE&amp;W Closed Carter Lake-C&amp;D Landfill

Project Number: ANDEX 06101

## LABORATORY DUPLICATE QC DATA

Analyte	Seq/ Batch	Source Result	Spike Level	Units	MDL	MRL	Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
<b>Dissolved Metals by SW 846 Series Methods</b>													
QC Source Sample: CPJ0884-03													
Arsenic	6100899	0.0150		mg/L	N/A	0.00100	0.0151				1	15	
Iron	6101465	0.645		mg/L	N/A	0.100	0.657				2	15	
Iron	6101465	29.3		mg/L	N/A	0.100	29.1				1	15	

BARKER, LEMAR & ASSOCIATES  
 1801 Industrial Circle  
 West Des Moines, IA 50265  
 Yuta Naganuma

Work Order: CPJ0968

Received: 10/13/06

Reported: 10/30/06 08:09

Project: AE&W Closed Carter Lake-C&D Landfill

Project Number: ANDEX 06101

## LCS/LCS DUPLICATE QC DATA

Analyte	Seq/ Batch	Source Result	Spike Level	Units	MDL	MRL	Dup Result	% REC	Dup Result	% REC	RPD	RPD	Q
<b>General Chemistry Parameters</b>													
Chloride	6101185	99.1	mg/L	N/A	5.00	106	107	90-110					
Total Organic Halides	6101263	0.100	mg/L Cl-	N/A	0.0100	0.0973	97	70-130					
Phenol	6101327	0.160	mg/L	N/A	0.0200	0.155	97	90-110					
Phenol	6101327	0.160	mg/L	N/A	0.0200	0.160	100	90-110					
Phenol	6101337	0.100	mg/L	N/A	0.0200	0.104	104	90-110					
Phenol	6101339	0.100	mg/L	N/A	0.0200	0.103	103	90-110					
Chemical Oxygen Demand	6101399	250	mg/L	N/A	10.0	242	97	90-110					
Ammonia as N	6101430	9.43	mg/L	N/A	N/A	10.1	107	90-110					
<b>Dissolved Metals by SW 846 Series Methods</b>													
Arsenic	6100899	0.0407	mg/L	N/A	0.00100	0.0425	104	80-120					
Arsenic	6100931	0.0400	mg/L	N/A	0.00200	0.0402	100	80-120					
Iron	6100935	2.00	mg/L	N/A	0.100	1.91	96	85-115					
Iron	6101465	10.0	ug/mL	N/A	N/A	9.83	98	85-115					

BARKER, LEMAR & ASSOCIATES  
 1801 Industrial Circle  
 West Des Moines, IA 50265  
 Yuta Naganuma

Work Order: CPJ0968

Received: 10/13/06

Reported: 10/30/06 08:09

Project: AE&W Closed Carter Lake-C&D Landfill

Project Number: ANDEX 06101

## MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC DATA

Analyte	Seq/ Batch	Source Result	Spike Level	Units	MDL	MRL	Dup Result	% REC	Dup Result	% REC	REC Limits	RPD	RPD Limit	Q
<b>General Chemistry Parameters</b>														
QC Source Sample: CPJ0968-01														
Chloride	6101185	84.7	25.0	mg/L	N/A	5.00	110	111	101	105	90-110	1	20	
QC Source Sample: CPJ0832-01														
Total Organic Halides	6101263	0.0114	0.100	mg/L Cl-	N/A	0.0100	0.107	0.0962	96	85	75-125	11	20	
QC Source Sample: CPJ1285-01														
Phenol	6101327	0.0146	0.160	mg/L	N/A	0.0200	0.164		93		90-110			
QC Source Sample: CPJ1406-01														
Phenol	6101327	0.00562	0.160	mg/L	N/A	0.0200	0.160	0.159	96	96	90-110	1	15	
QC Source Sample: CPJ0832-01														
Phenol	6101337	<0.020	0.100	mg/L	N/A	0.0200	0.101	0.100	101	100	90-110	1	15	
QC Source Sample: CPJ0968-05														
Phenol	6101339	0.00357	0.100	mg/L	N/A	0.0200	0.102	0.0961	98	93	90-110	6	15	
QC Source Sample: CPJ0938-03														
Chemical Oxygen Demand	6101399	5.70	50.0	mg/L	N/A	5.00	58.0	58.1	105	105	75-125	0	20	
QC Source Sample: CPJ0938-04														
Ammonia as N	6101430	0.265	10.0	mg/L	N/A	0.200	9.81	9.93	95	97	90-110	1	20	
<b>Dissolved Metals by SW 846 Series Methods</b>														
QC Source Sample: CPJ0958-09														
Arsenic	6100931	<0.0010	0.0400	mg/L	N/A	0.00200	0.0499	0.0481	125	120	75-125	4	20	
QC Source Sample: CPJ0990-02														
Iron	6100935	<0.10	2.00	mg/L	N/A	0.100	1.94	1.93	97	96	75-125	1	10	

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Work Order: CPJ0968

Received: 10/13/06

Reported: 10/30/06 08:09

Project: AE&W Closed Carter Lake-C&D Landfill  
 Project Number: ANDEX 06101

## OTHER

Analyte	Seq/ Batch	Source	Spike	Units	MDL	MRL	Dup	%	Dup	% REC	RPD	RPD Limit	Q
			Result				Result	REC	%REC	Limits			
<b>Dissolved Metals by SW 846 Series Methods</b>													
QC Source Sample: CPJ0884-07													
Arsenic	6100899	0.00826	0.0227	ug/mL	N/A	N/A	0.0346	116		75-125			
QC Source Sample: CPJ0938-02	6101465	0.159	1.92	ug/mL	N/A	N/A	2.00	96		75-125			
QC Source Sample: CPJ0956-03	6101465	138	1.92	ug/mL	N/A	N/A	132	-312		75-125			MHA

BARKER, LEMAR & ASSOCIATES  
1801 Industrial Circle  
West Des Moines, IA 50265  
Yuta Naganuma

Work Order: CPJ0968  
Project: AE&W Closed Carter Lake-C&D Landfill  
Project Number: ANDEX 06101

Received: 10/13/06  
Reported: 10/30/06 08:09

## CERTIFICATION SUMMARY

TestAmerica - Cedar Falls, IA

Method	Matrix	Nelac	Iowa
EPA 350.1	Water - NonPotable	X	X
EPA 420.2	Water - NonPotable	X	X
SM 4500Cl E	Water - NonPotable	X	X
SM 5220D	Water - NonPotable	X	X
SW 6010B	Water - NonPotable	X	X
SW 7060A	Water - NonPotable	X	X
SW 9020	Water - NonPotable	X	X

*Any abnormalities or departures from sample acceptance policy shall be documented on the 'Sample Receipt and Temperature Log Form' and 'Sample Non-conformance Form' (if applicable) included with this report.*

*For information concerning certifications of this facility or another TestAmerica facility, please visit our website at [www.TestAmericaInc.com](http://www.TestAmericaInc.com)*

*Samples collected by TestAmerica Field Services personnel are noted on the Chain of Custody (COC) and are sampled in accordance with TA-CF SOP CF09-01.*

## DATA QUALIFIERS AND DEFINITIONS

MHA Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information  
S7 Sample breakthrough to 2nd section is > 10%. Results may be biased low.

## ADDITIONAL COMMENTS

Test America

Incorporation

700 Entries Now

Enterprise Utility

Cedar Falls, Iowa 50613

ANNEX 051

INDEX 891

Barker Lehrar Engine

Anderson Excavating

1001 Indian Stories

1801 Industrial Circle

West Des Moines 1A

F1E 000 001

104 Enterprise Drive Cedar Falls, Iowa 50613	INDEX 05101	SAMPLER: Barker Lemar Engineering Consultants SITE NAME: Anderson Excavating & Wrecking, Closed Carter Lake C&D Landfill (October) ADDRESS: 1801 Industrial Circle CITY/STATE/ZIP: West Des Moines, IA 50265 TELEPHONE NUMBER: 515-256-8814 SAMPLER BY: (PRINT NAME) _____ SIGNATURE: _____	REPORT TO: NAME: Yuta Nagahama COMPANY NAME: Barker Lemar Engineering Consultants PROJECT NAME: Anderson Excavating & Wrecking, Closed Carter Lake C&D Landfill (October) PROJECT NUMBER: INDEX 06101 ADDRESS: 1801 Industrial Circle CITY/STATE/ZIP: West Des Moines, IA 50265
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# TestAmerica

ANALYTICAL TESTING CORPORATION

704 ENTERPRISE DRIVE • CEDAR FALLS, IA 50613 • 800-750-2401 • 319-277-2425 FAX

## Sample Receipt and Temperature Log Form

Client: Barker Lemoor Engineering *Consultants* Project: \_\_\_\_\_

City: West Des Moines, IA

Date: 10-13-06 Receiver's Initials HDL Time (Delivered): 19:0

### Temperature Record

Cooler ID# (If Applicable)

TACF 491

2 °C / On Ice

Temp Blank

Temperature out of compliance

Custody seals present?

Yes

Custody seals intact?

Yes  No

Non-Conformance report started

### Thermometer:

- IR - 905085 "A"
- IR - 809065 "B"
- CF07-03-T2
- 22126775

### Courier:

- |                                    |  |
|------------------------------------|--|
| <input type="checkbox"/> Airborne  | <input type="checkbox"/> Speedy                |
| <input type="checkbox"/> UPS       | <input checked="" type="checkbox"/> TA Courier |
| <input type="checkbox"/> Velocity  | <input type="checkbox"/> TA Field Svcs         |
| <input type="checkbox"/> FedEx     | <input type="checkbox"/> Client                |
| <input type="checkbox"/> DHL       |  |
| <input type="checkbox"/> US Postal | <input type="checkbox"/> Other                 |

### Exceptions Noted

Sample(s) not received in a cooler.

Samples(s) received same day of sampling.

Evidence of a chilling process

Temperature not taken:  
\_\_\_\_\_

Log-In by:

CW MF EM  
OT \_\_\_\_\_

\*Refer to SOP CF01-01 for Temperature Criteria

# TestAmerica

ANALYTICAL TESTING CORPORATION

704 ENTERPRISE DRIVE • CEDAR FALLS, IA 50613 • 800-750-2401 • 319-277-2425 FAX

## Sample Receipt and Temperature Log Form

Client: Barker Lerner Engineering Consultants Project: \_\_\_\_\_

City: West Des Moines, IA

Date: 10-13-06 Receiver's Initials HDF Time (Delivered): 1910

### Temperature Record

Cooler ID# (If Applicable)

HA-99

3 °C / On Ice

Temp Blank

Temperature out of compliance

Custody seals present?

Yes

Custody seals intact?

Yes  No

Non-Conformance report started

### Thermometer:

- IR - 905085 "A"
- IR - 809065 "B"
- CF07-03-T2
- 22126775

### Courier:

- |                                    |  |
|------------------------------------|--|
| <input type="checkbox"/> Airborne  | <input type="checkbox"/> Speedy                |
| <input type="checkbox"/> UPS       | <input checked="" type="checkbox"/> TA Courier |
| <input type="checkbox"/> Velocity  | <input type="checkbox"/> TA Field Svcs         |
| <input type="checkbox"/> FedEx     | <input type="checkbox"/> Client                |
| <input type="checkbox"/> DHL       | <input type="checkbox"/> Other                 |
| <input type="checkbox"/> US Postal |  |

### Exceptions Noted

<input type="checkbox"/>	Sample(s) not received in a cooler.
<input type="checkbox"/>	Samples(s) received same day of sampling.
<input type="checkbox"/>	Evidence of a chilling process
<input type="checkbox"/>	Temperature not taken: _____

Log-In by:

CW MF EM

OT \_\_\_\_\_

\*Refer to SOP CF01-01 for Temperature Criteria

**APPENDIX D**  
**EXCEEDANCE TABLE**

**Summary of Statistical Exceedances Groundwater  
Monitoring Wells by Well Cluster  
Carter Lake Construction and Demolition Landfill - 78-SDP-02-80**

**MW-1 - Cluster DN1**

**Chemical Oxygen Demand**

Mean: 100.5	STD: 15.6	Exceedances Level: 131.71
Current Action Levels: None Established		
10/11/2006	308 mg/L	

**Nitrogen, Ammonia**

Mean: 3.122	STD: 1.670	Exceedances Level: 6.4620
Current Action Levels: HAL - 30 mg/L		
10/11/2006	8.38 mg/L	

**Total Organic Halogens**

Mean: 0.0312	STD: 0.0225	Exceedances Level: 0.07610
Current Action Levels: None Established		
10/11/2006	0.758 mg/L	

**MW-3 - Cluster DN1**

**Chloride**

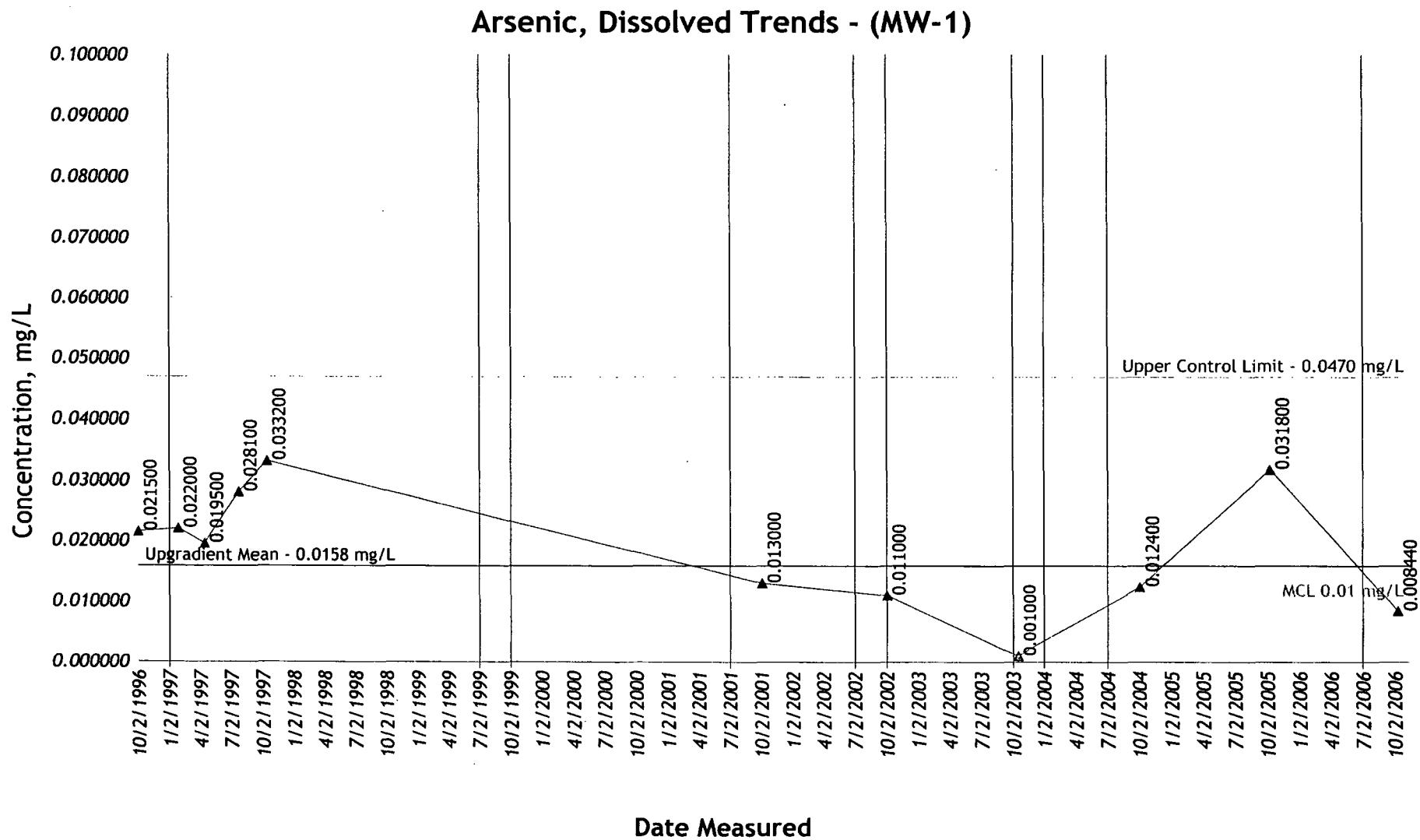
Mean: 76.6	STD: 30.3	Exceedances Level: 137.30
Current Action Levels: None Established		
10/11/2006	144 mg/L	

**MW-5 - Cluster DN1**

**Total Organic Halogens**

Mean: 0.0312	STD: 0.0225	Exceedances Level: 0.07610
Current Action Levels: None Established		
10/11/2006	0.213 mg/L	

**APPENDIX E**  
**GRAPHS OF ANALYTICAL PARAMETERS/MONITORING POINT**



1

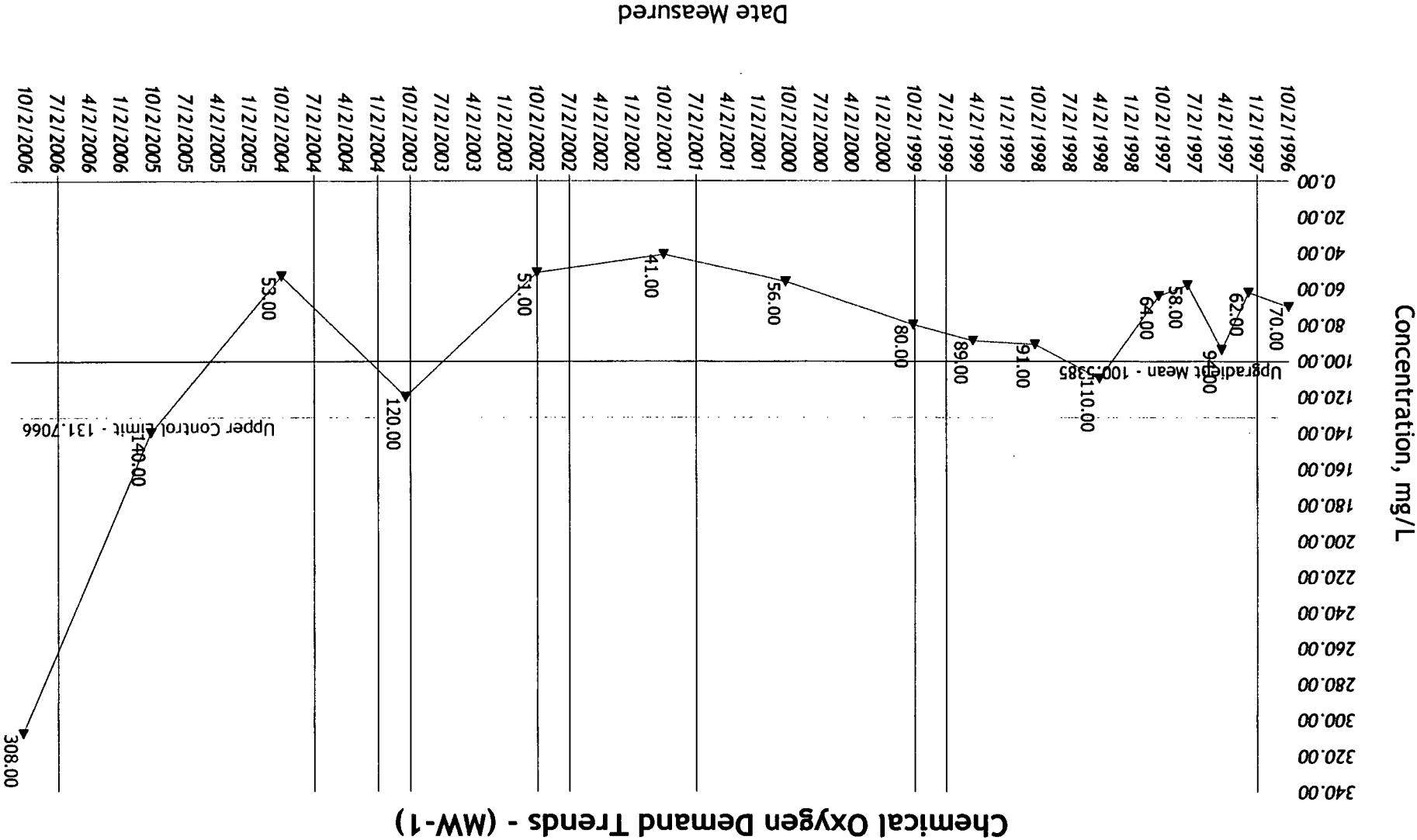
**Arsenic, Dissolved**  
**Carter Lake Construction and Demolition Landfill**  
78-SDP-02-80

06101  
11/13/2006 1:04:55 PM

Carter Lake Construction and Demolition Landfill  
Chemical Oxygen Demand

06101  
11/13/2006 1:04:56 PM

2



**3**

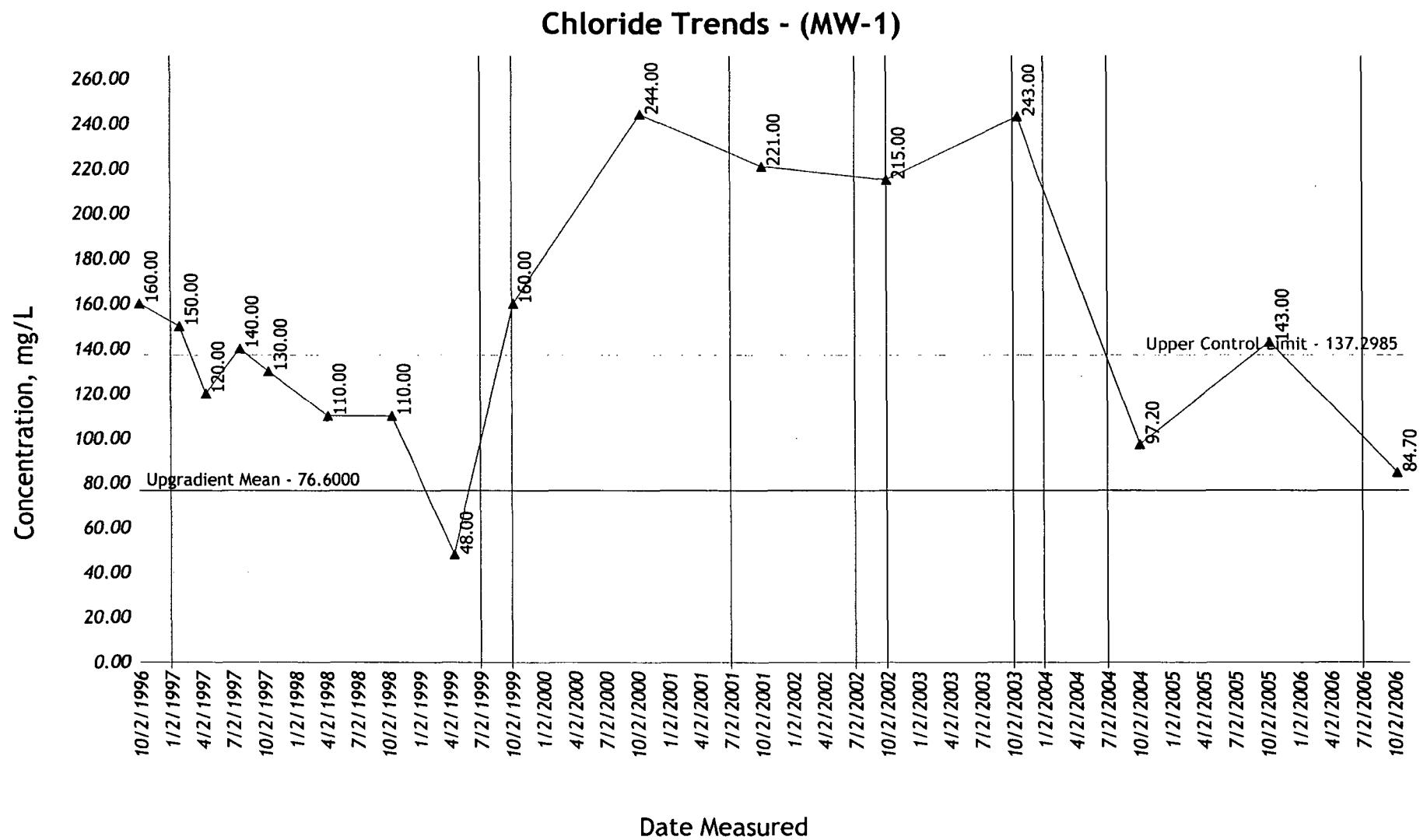
### **Chloride**

**Carter Lake Construction and Demolition Landfill**

78-SDP-02-80

06101

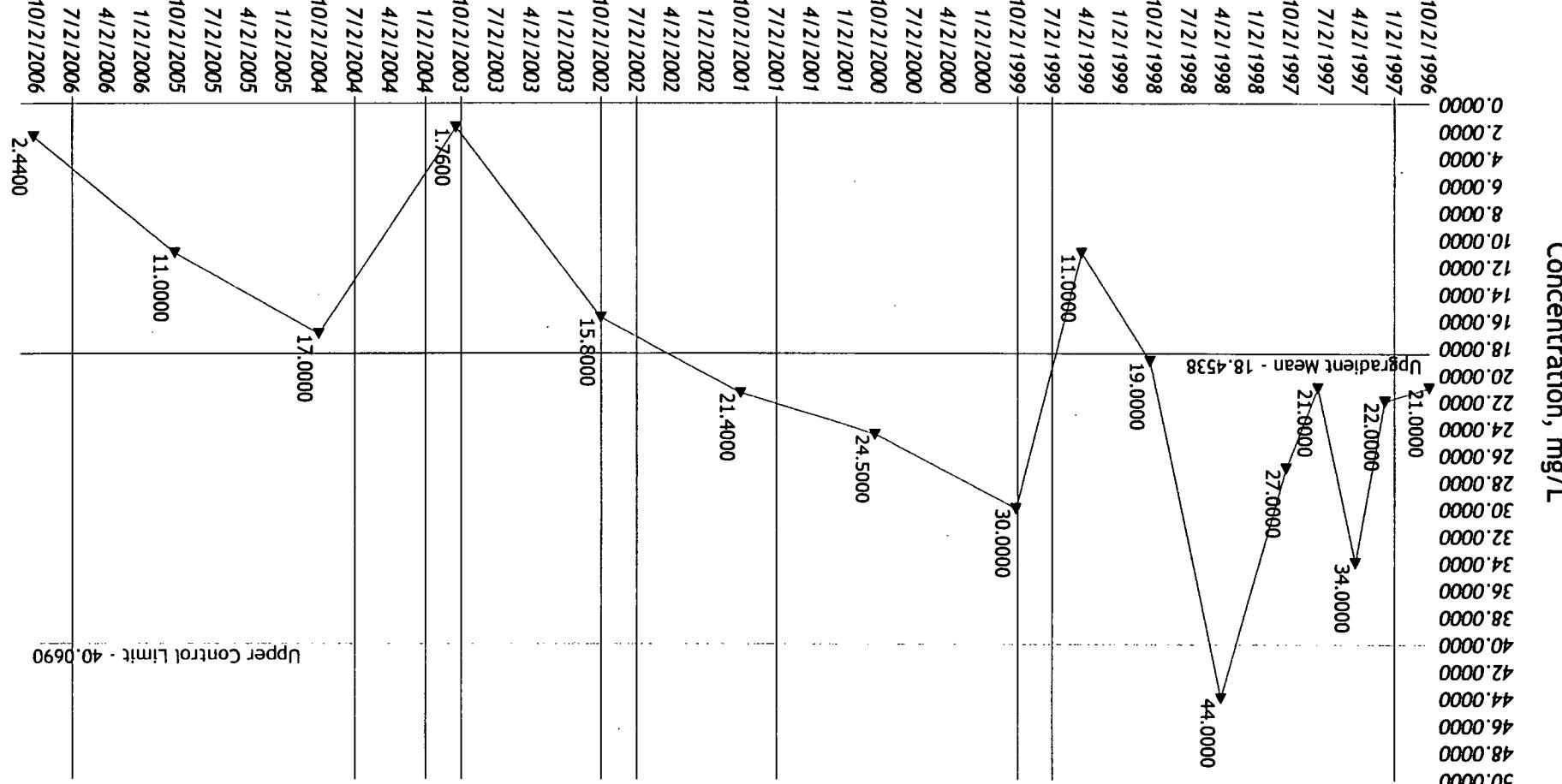
11/13/2006 1:04:56 PM



**Carter Lake Construction and Demolition Landfill**

**Iron, Dissolved**

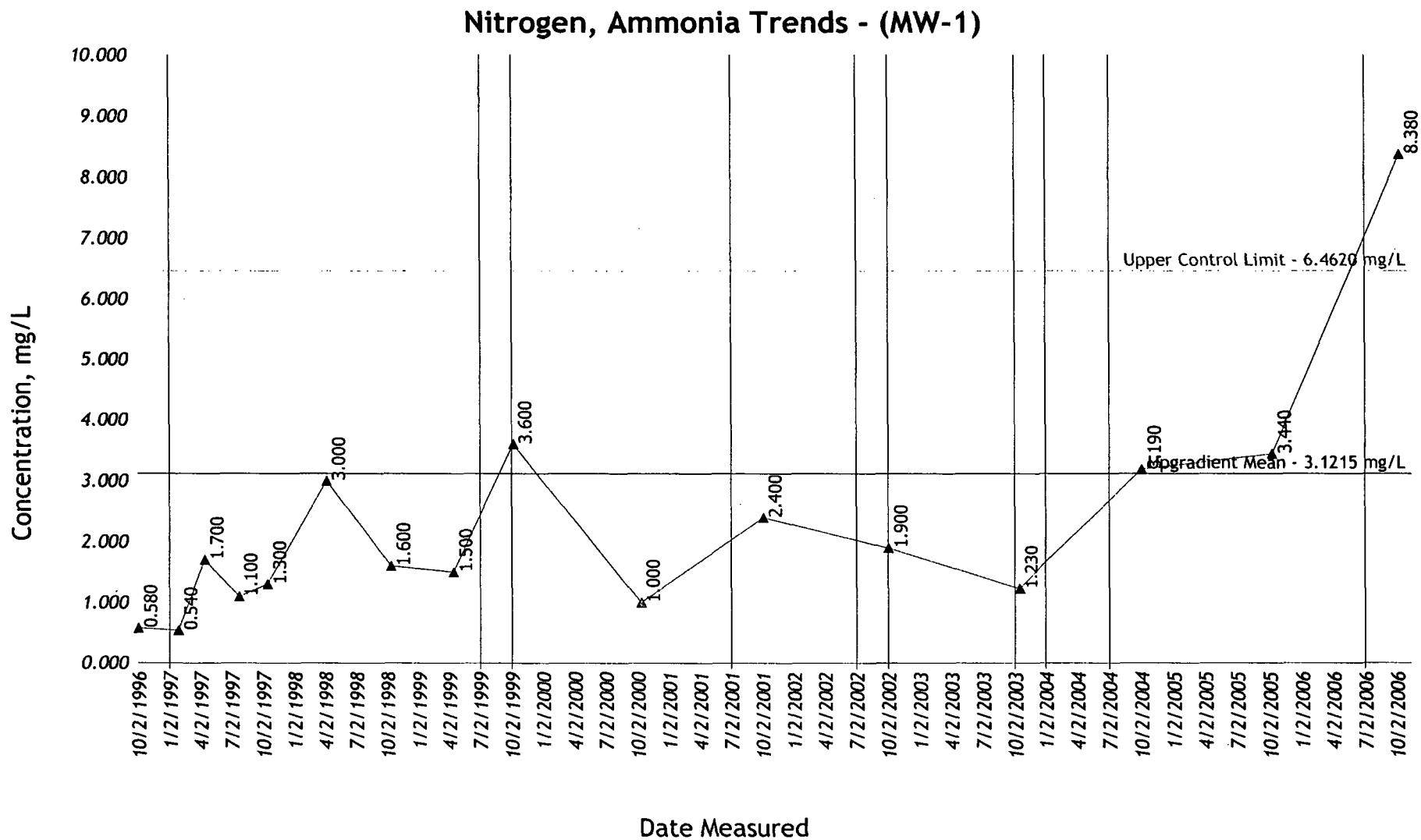
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11/13/2006 1:04:56 PM



5

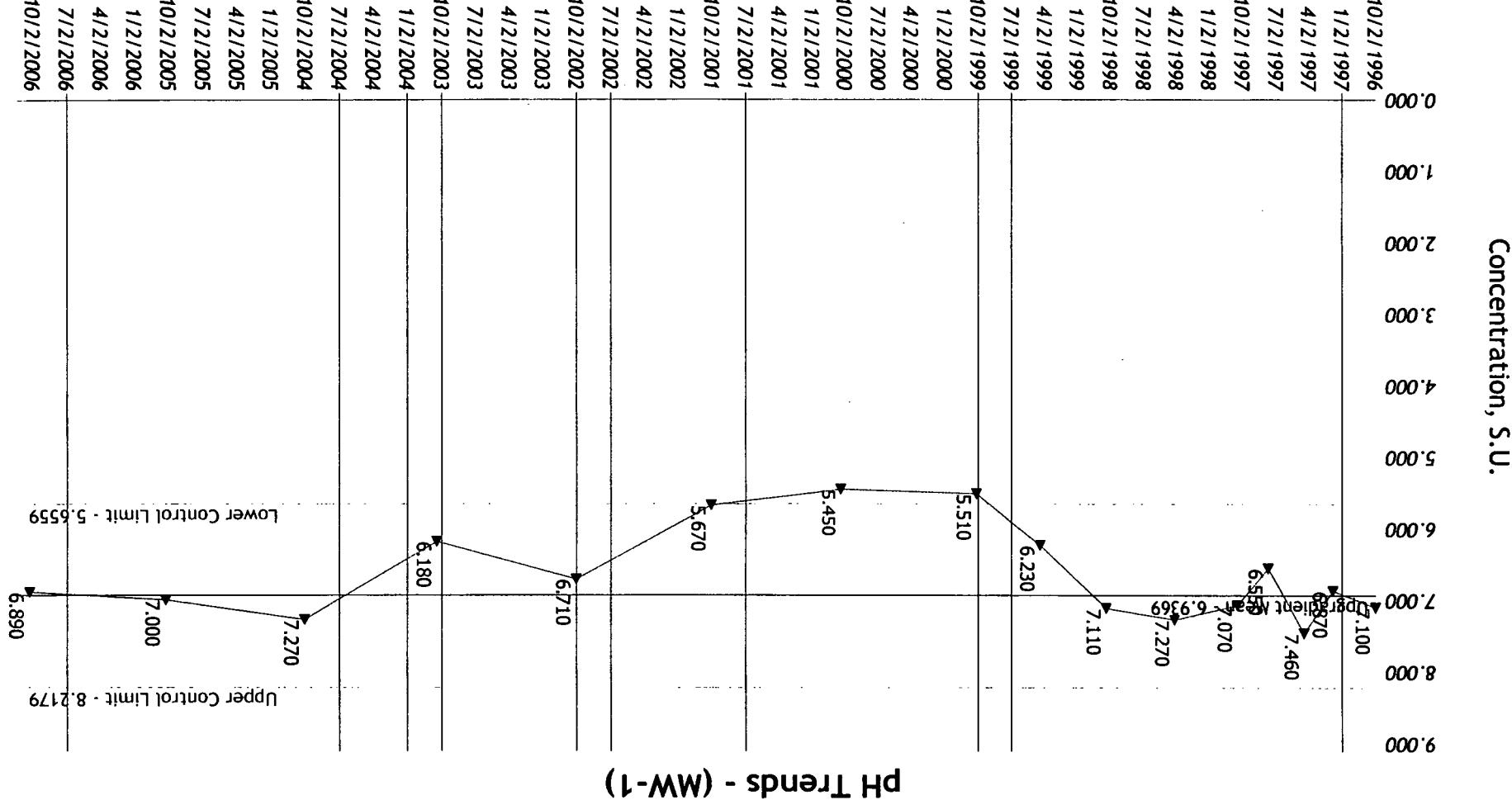
Nitrogen, Ammonia  
Carter Lake Construction and Demolition Landfill  
78-SDP-02-80

06101  
11/13/2006 1:04:56 PM

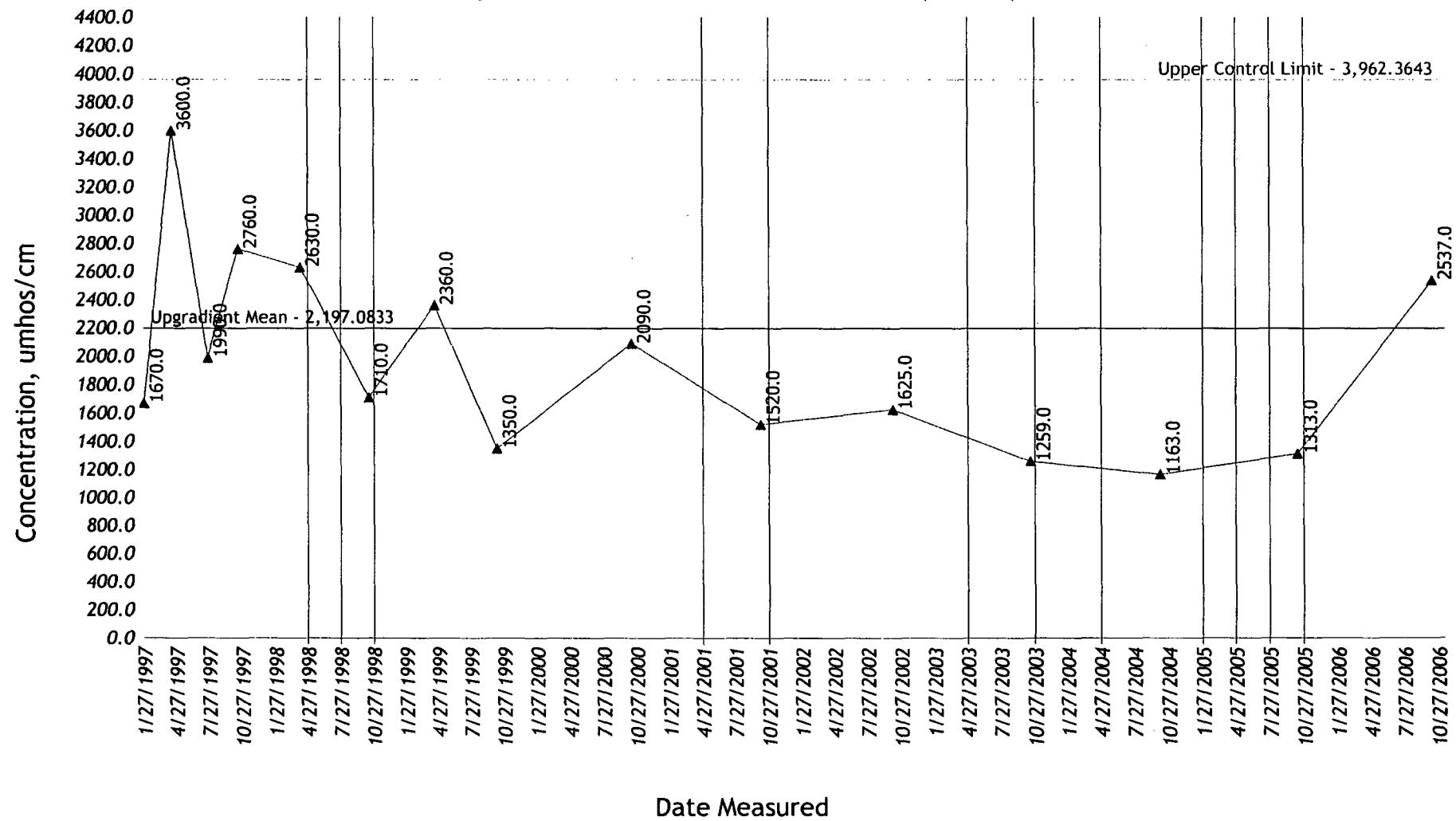


## Carter Lake Construction and Demolition Landfill

PH

06101  
11/13/2006 1:04:56 PM

## Specific Conductance Trends - (MW-1)



7

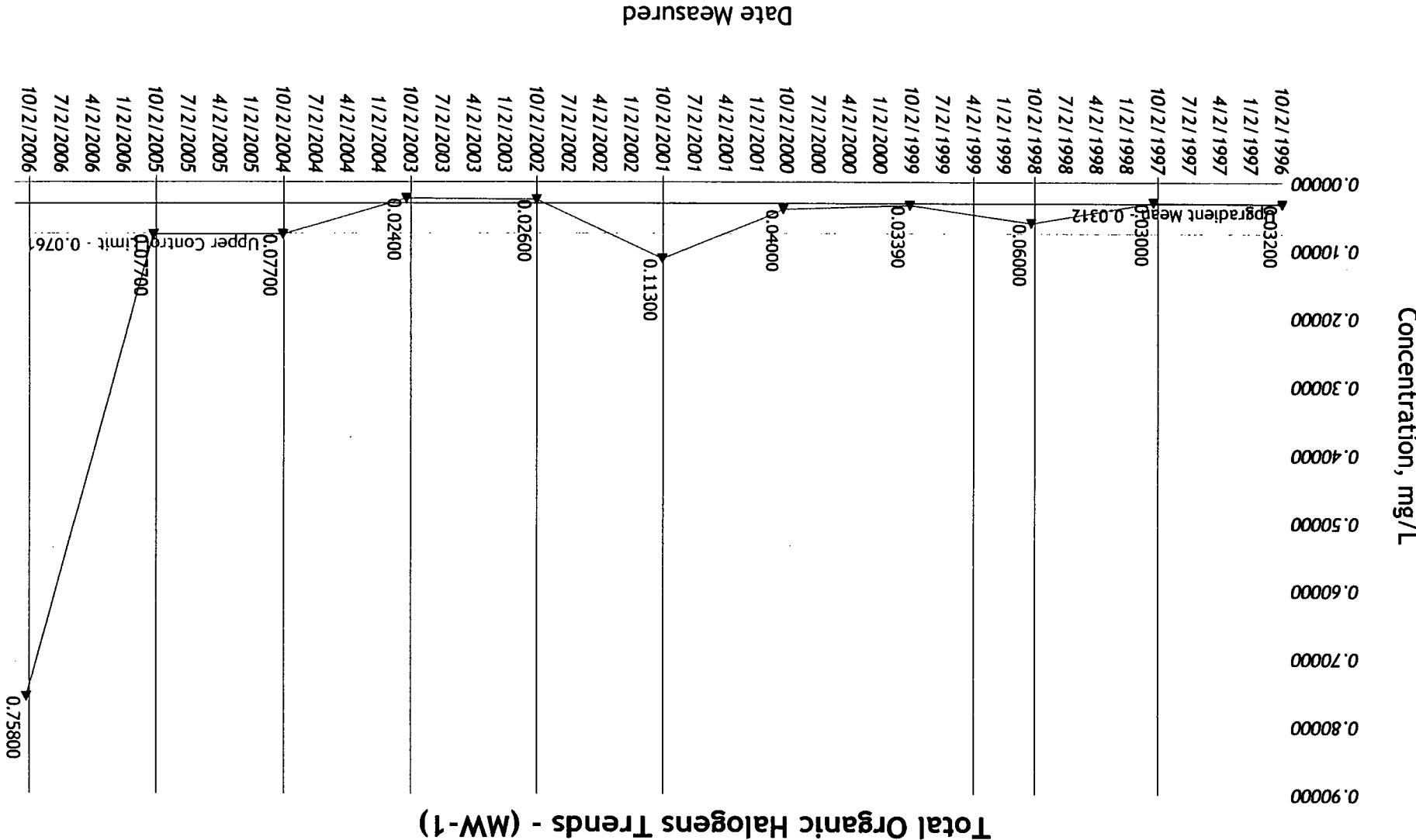
Specific Conductance  
Carter Lake Construction and Demolition Landfill  
78-SDP-02-80

06101  
11/13/2006 1:04:57 PM

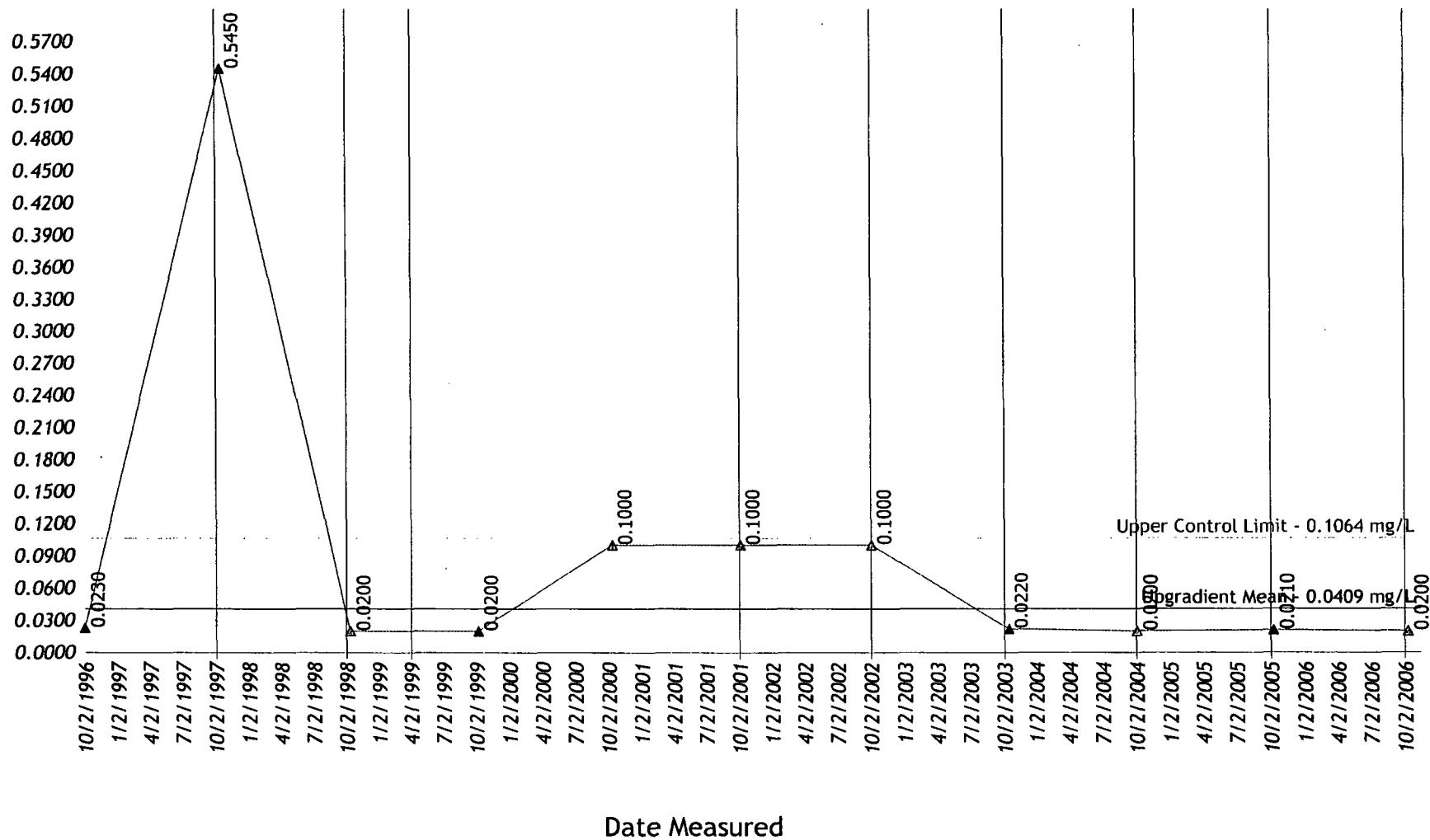
**Carter Lake Construction and Demolition Landfill**

**Total Organic Halogens**

06101  
11/13/2006 1:04:57 PM



Concentration, mg/L



9

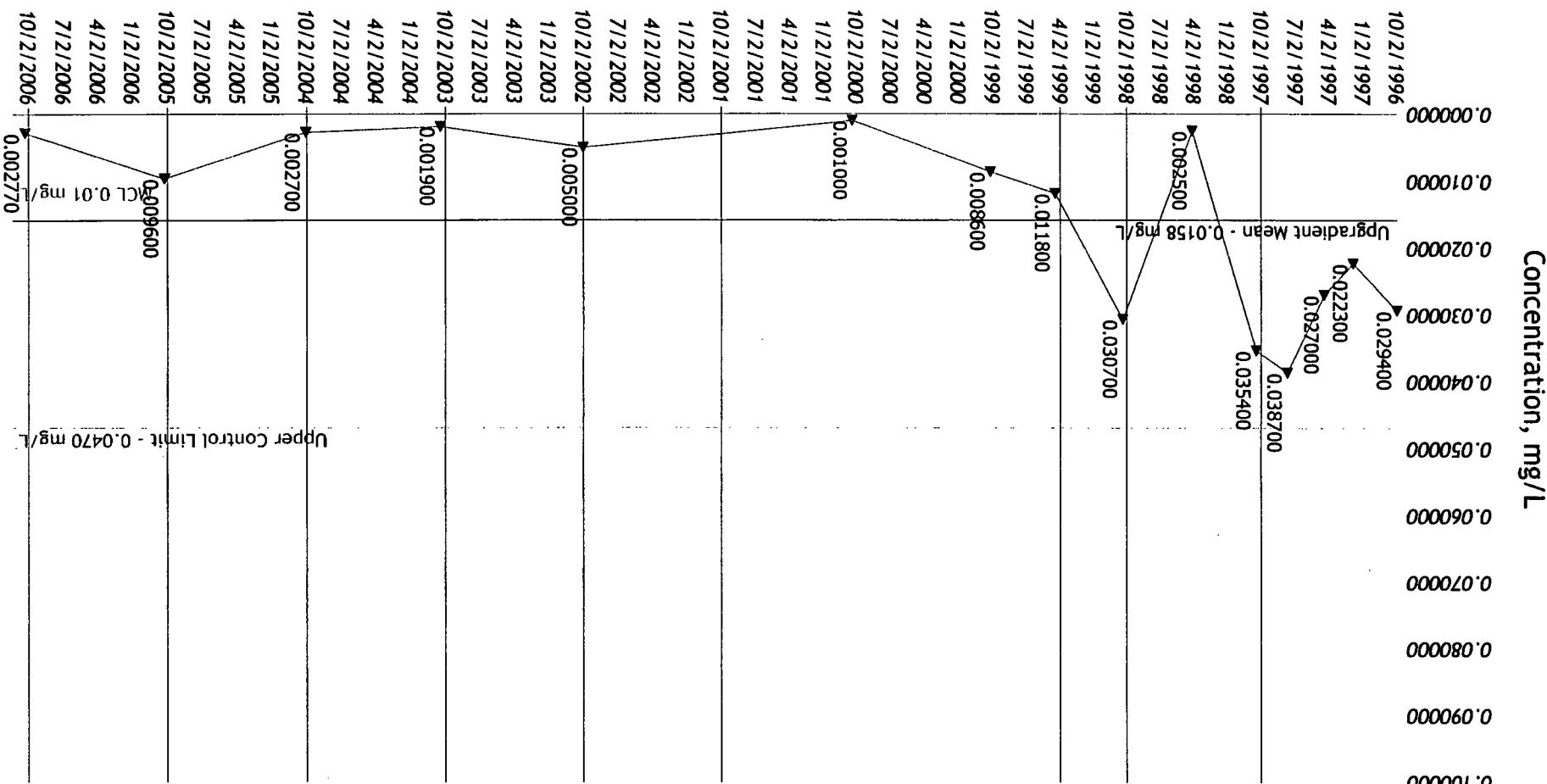
**Total Phenols**  
**Carter Lake Construction and Demolition Landfill**  
78-SDP-02-80

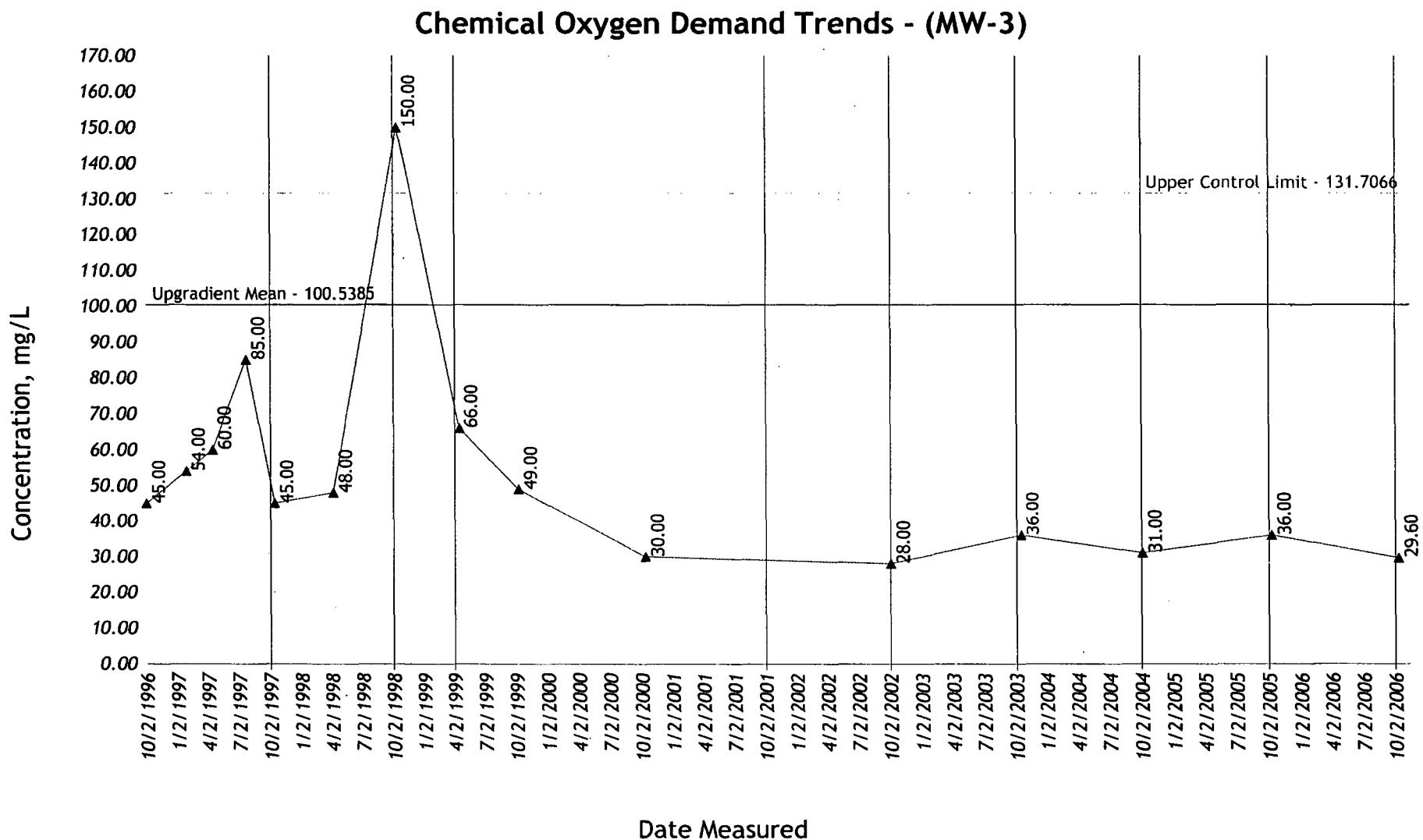
06101

11/13/2006 1:04:57 PM

## Arsenic, Dissolved

## Carter Lake Construction and Demolition Landfill

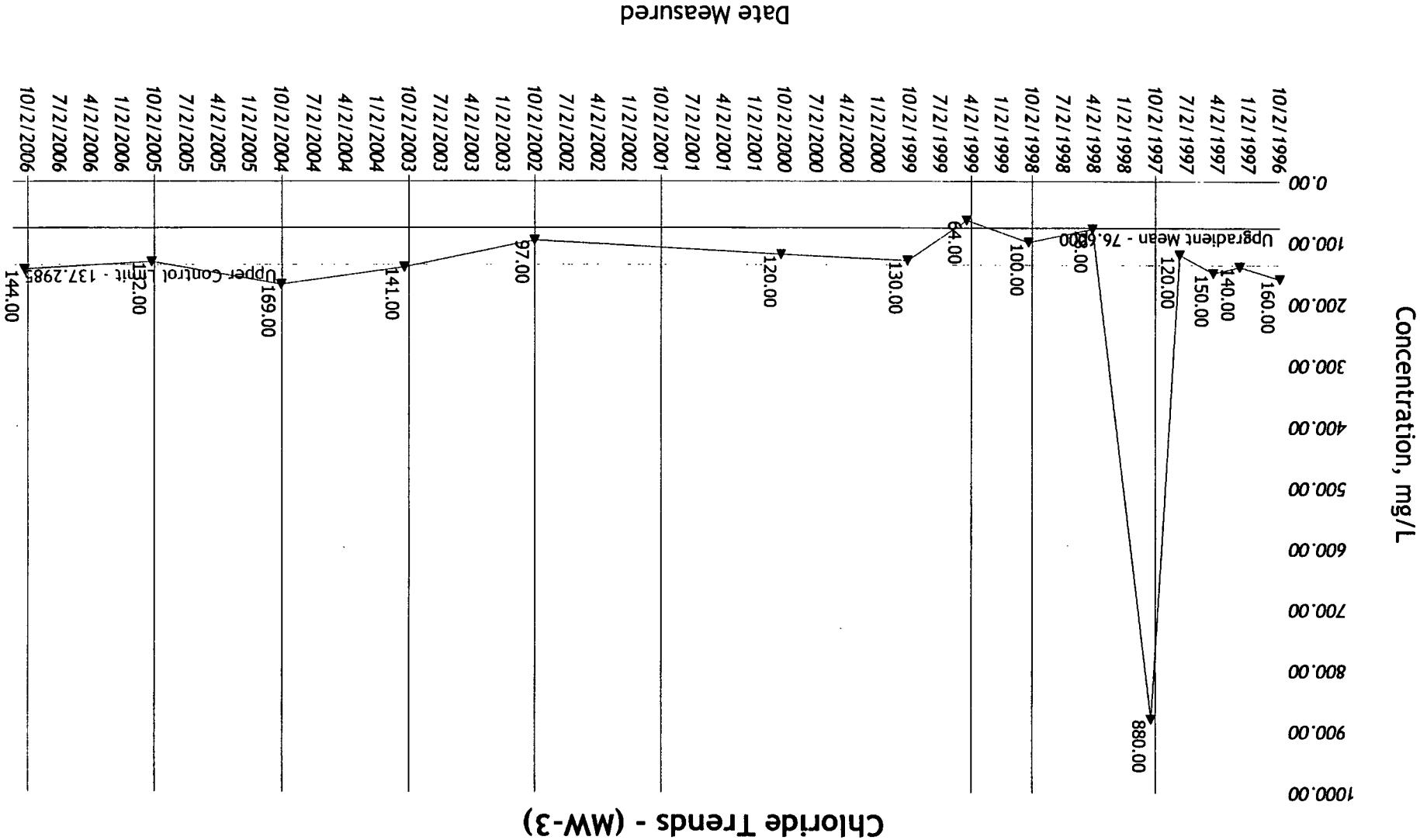
06101  
11/13/2006 1:04:57 PM



11

**Chemical Oxygen Demand**  
**Carter Lake Construction and Demolition Landfill**  
 78-SDP-02-80

06101  
 11/13/2006 1:04:57 PM

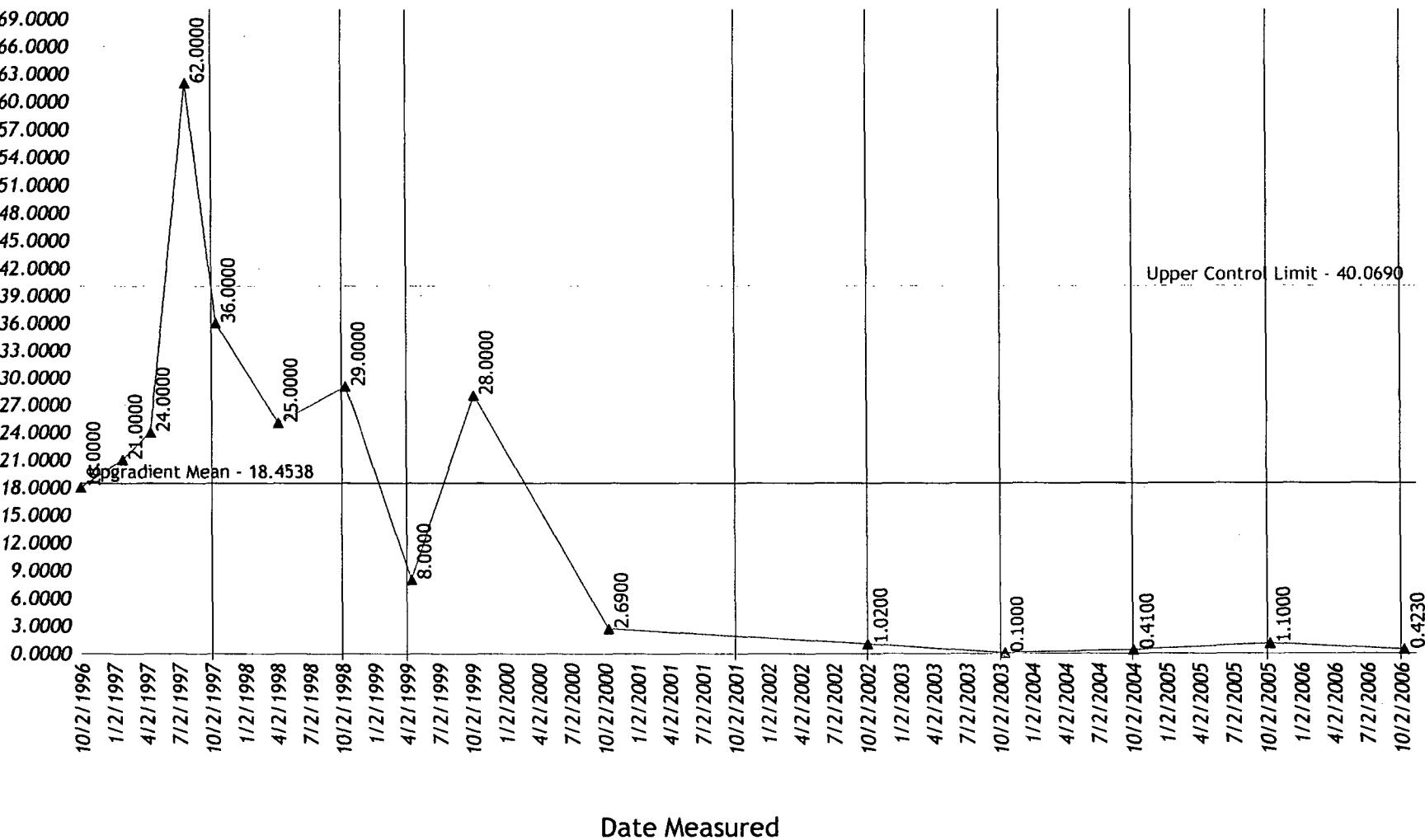


13

**Iron, Dissolved**  
**Carter Lake Construction and Demolition Landfill**  
78-SDP-02-80

Concentration, mg/L

### Iron, Dissolved Trends - (MW-3)

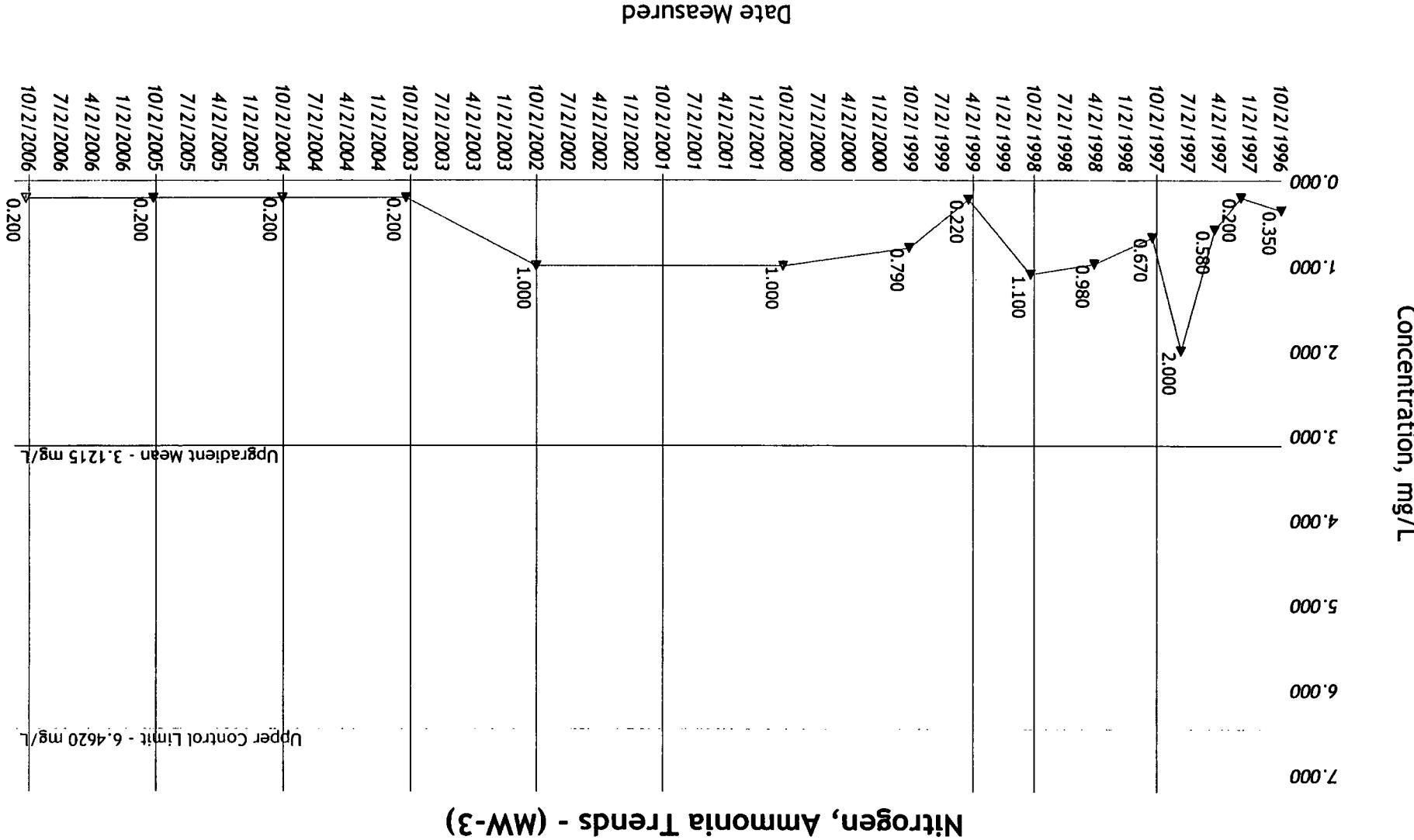


06101

11/13/2006 1:04:58 PM

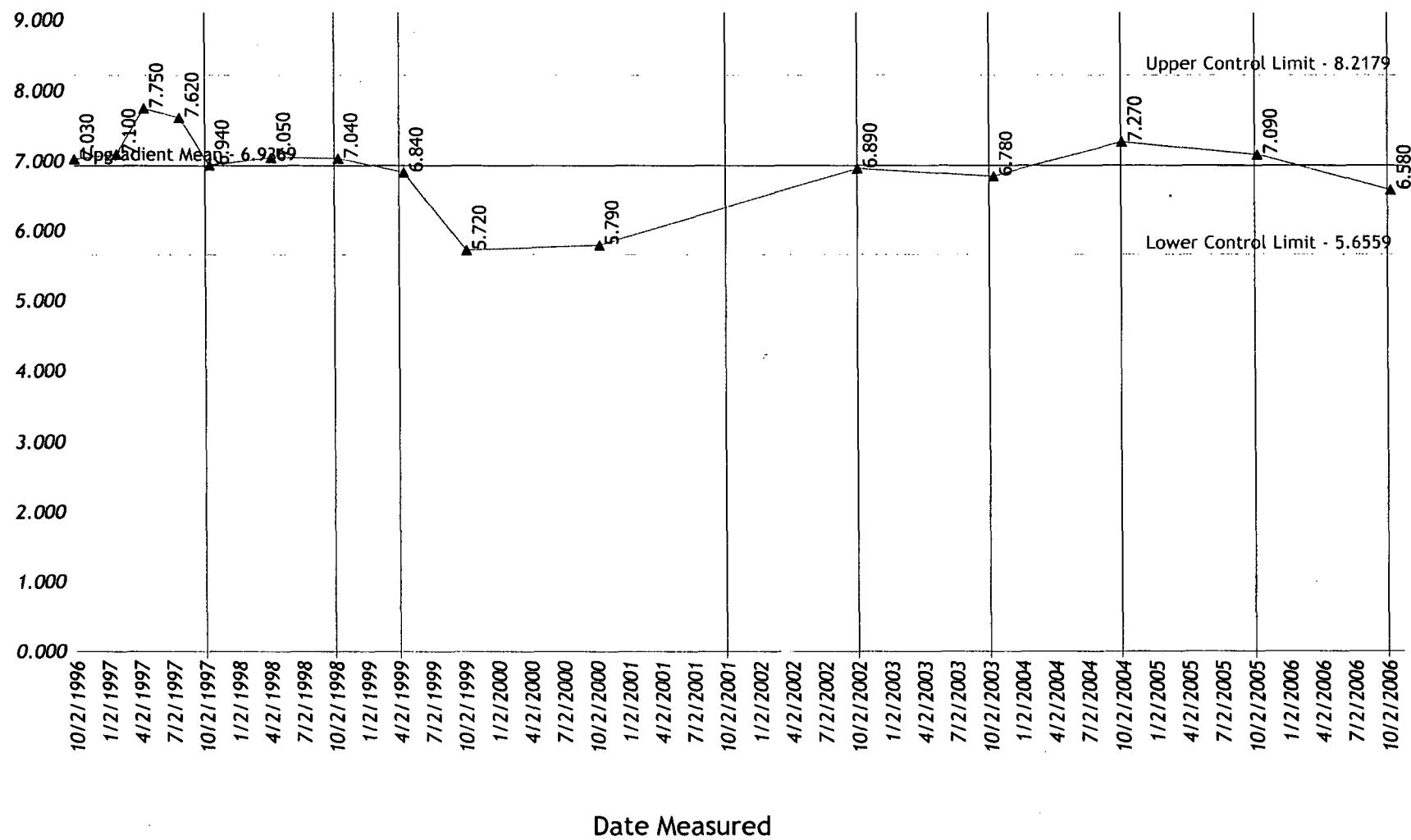
## Nitrogen, Ammonia

Carter Lake Construction and Demolition Landfill

06101  
11/13/2006 1:04:58 PM

**Concentration, S.U.**

**pH Trends - (MW-3)**



**15**

**pH**

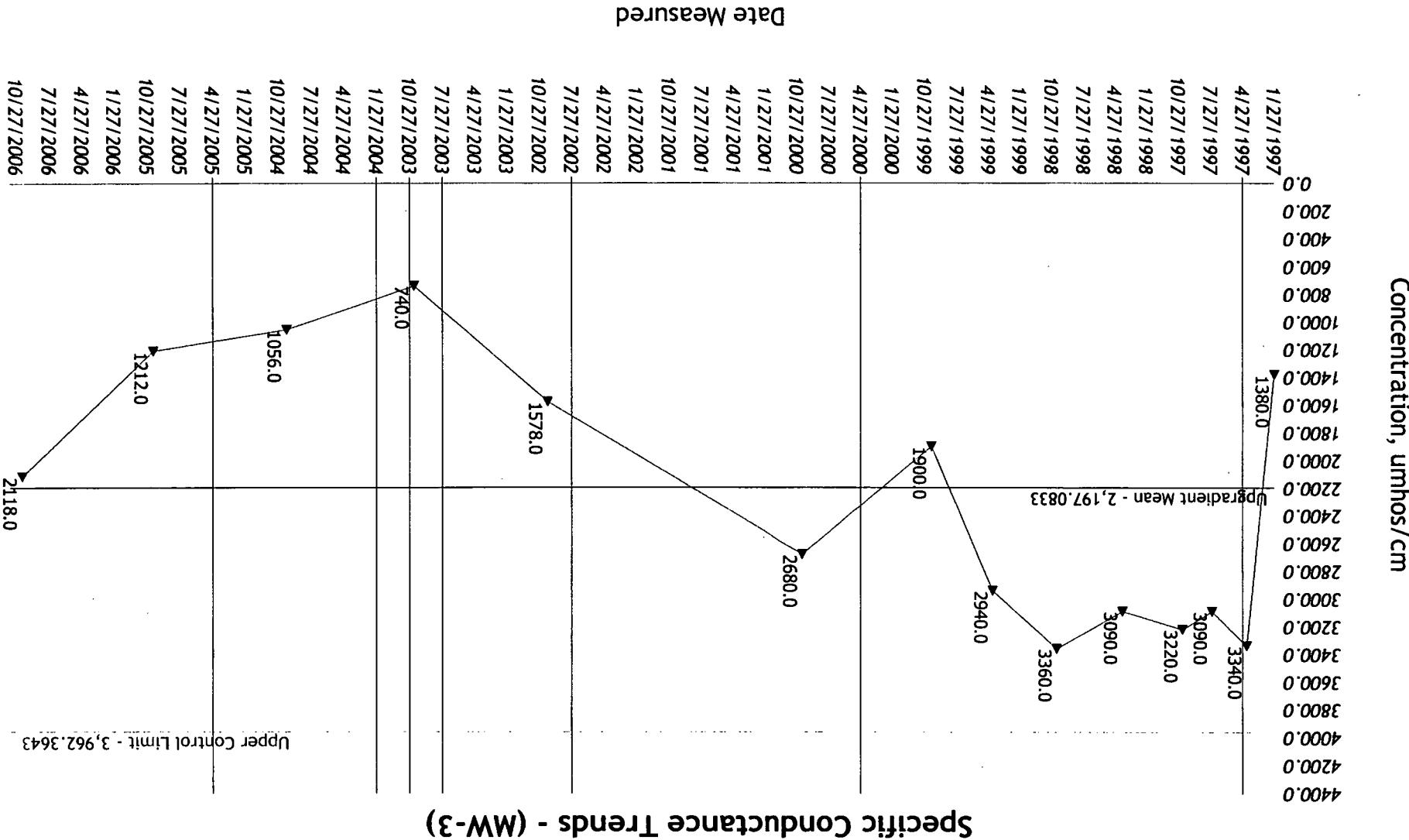
**Carter Lake Construction and Demolition Landfill**

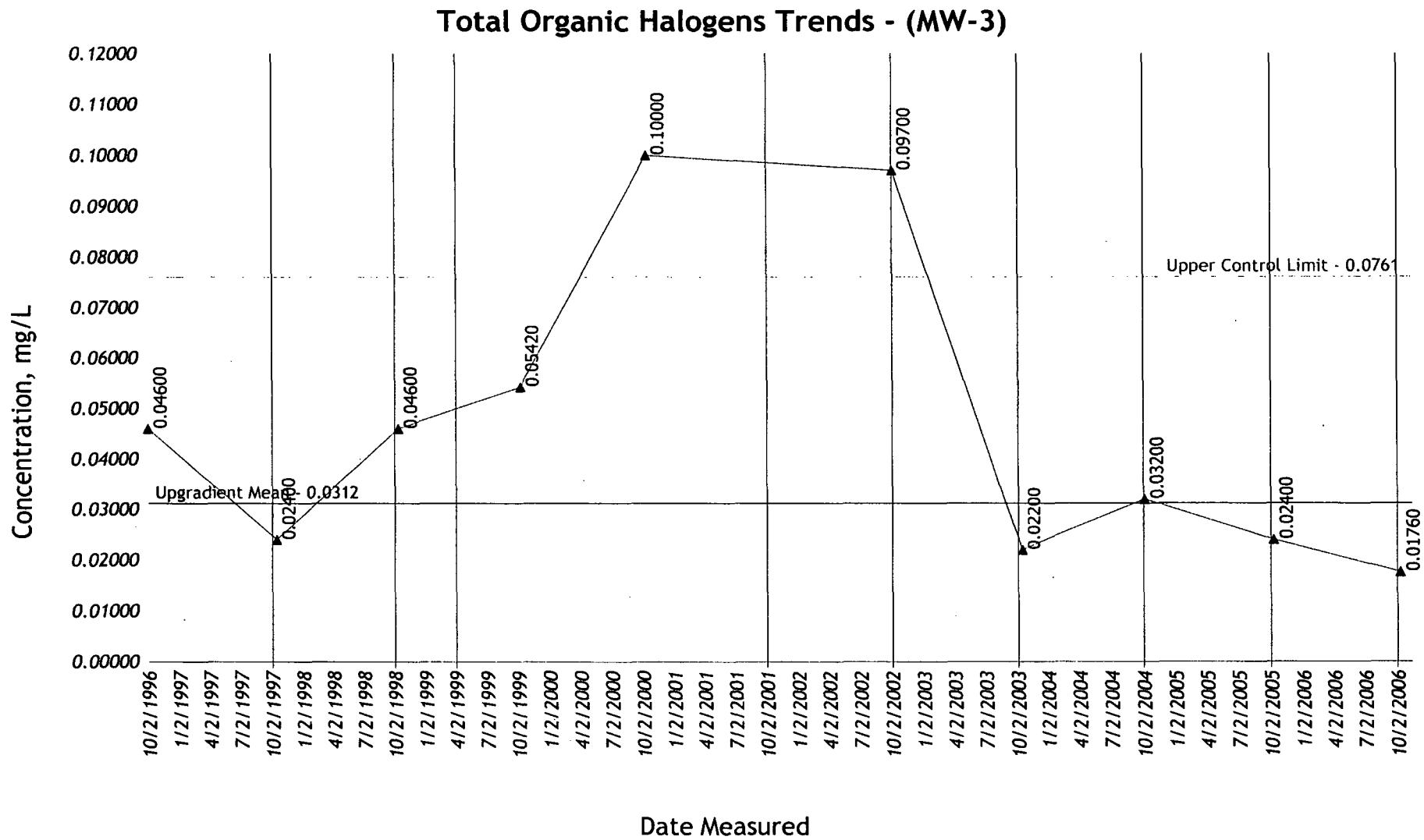
78-SDP-02-80

**06101**

11/13/2006 1:04:58 PM

06101  
11/13/2006 1:04:58 PM





17

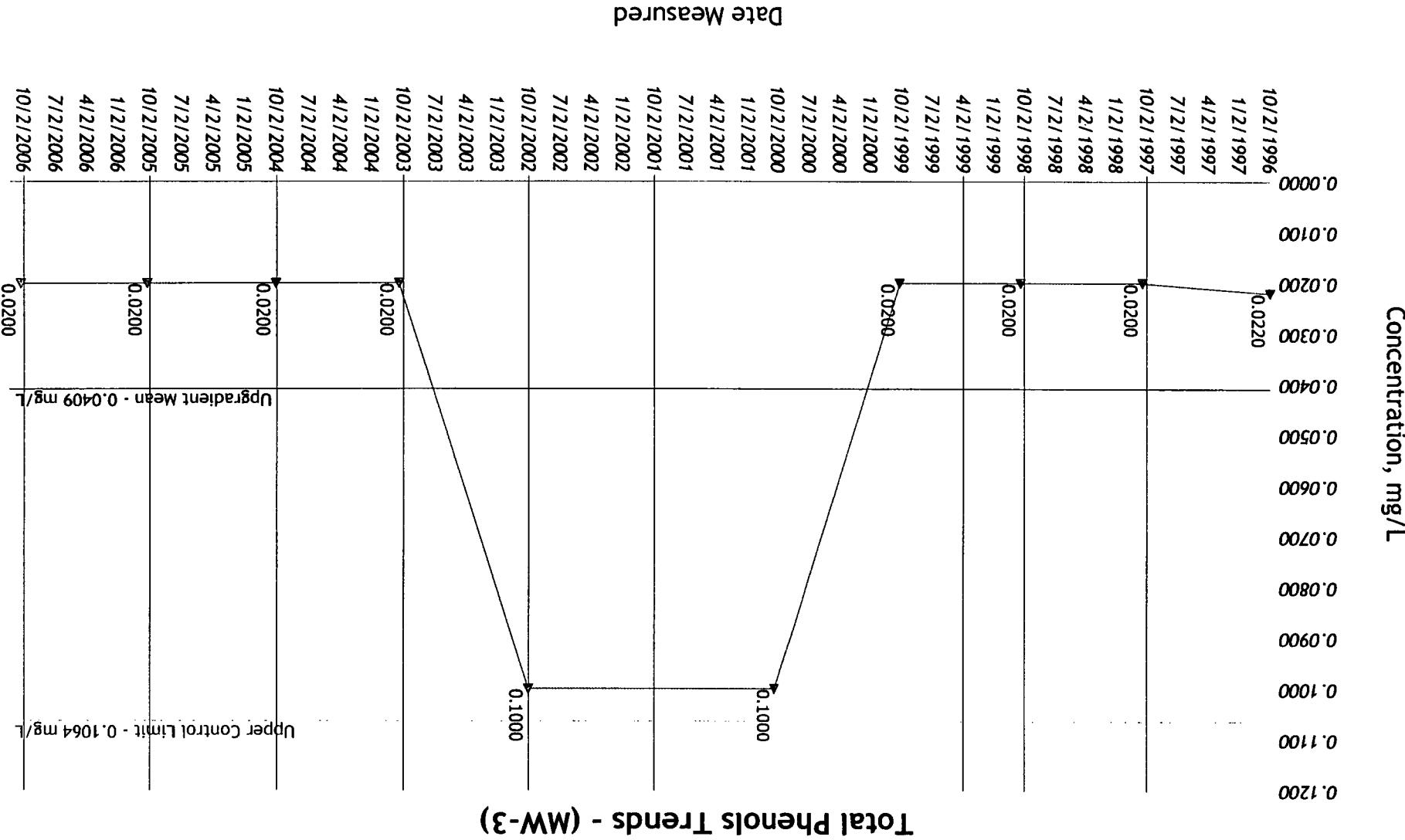
**Total Organic Halogens**  
**Carter Lake Construction and Demolition Landfill**  
 78-SDP-02-80

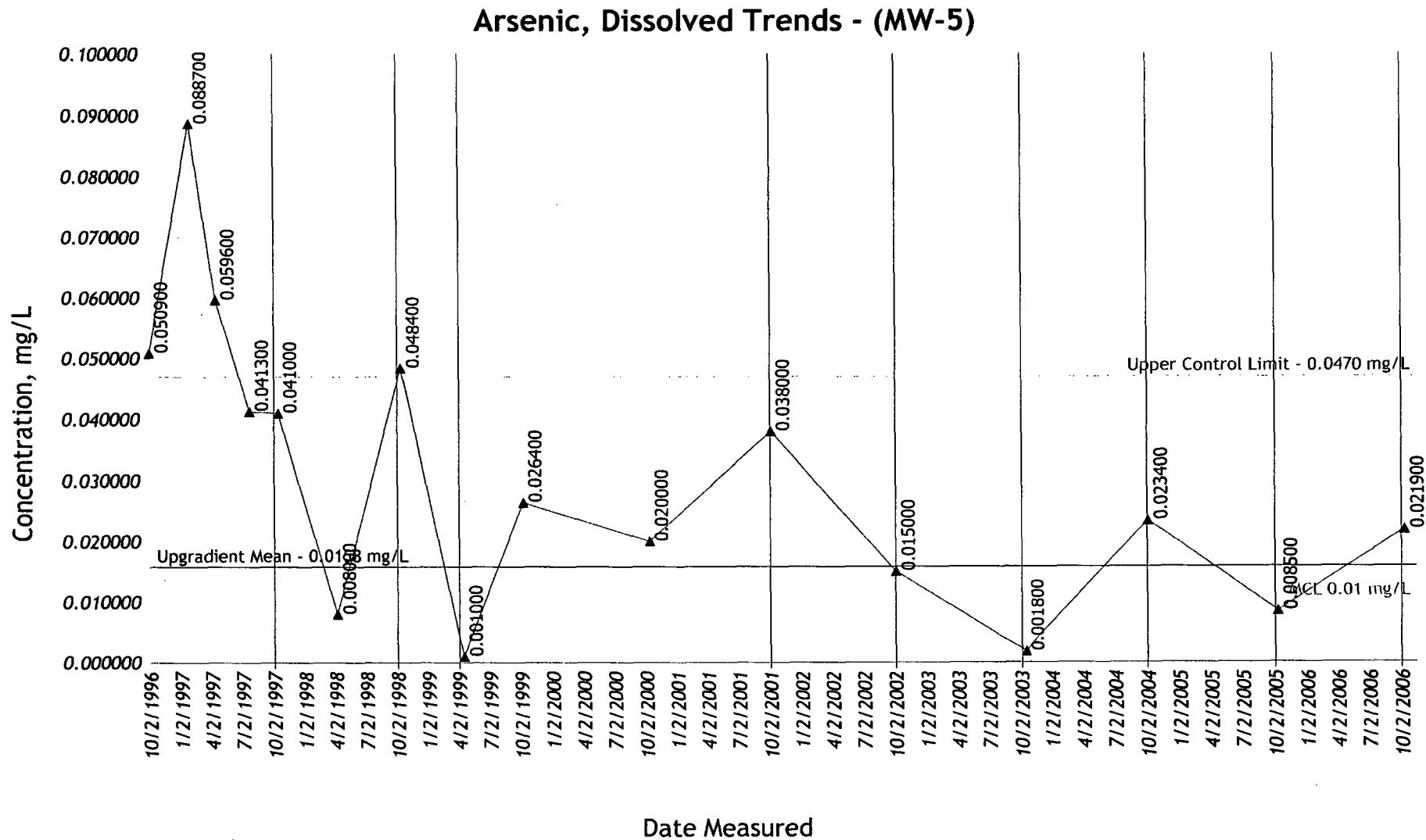
06101  
 11/13/2006 1:04:58 PM

## Total Phenols

## Carter Lake Construction and Demolition Landfill

11/13/2006 1:04:58 PM  
06101





19

**Arsenic, Dissolved**  
**Carter Lake Construction and Demolition Landfill**  
 78-SDP-02-80

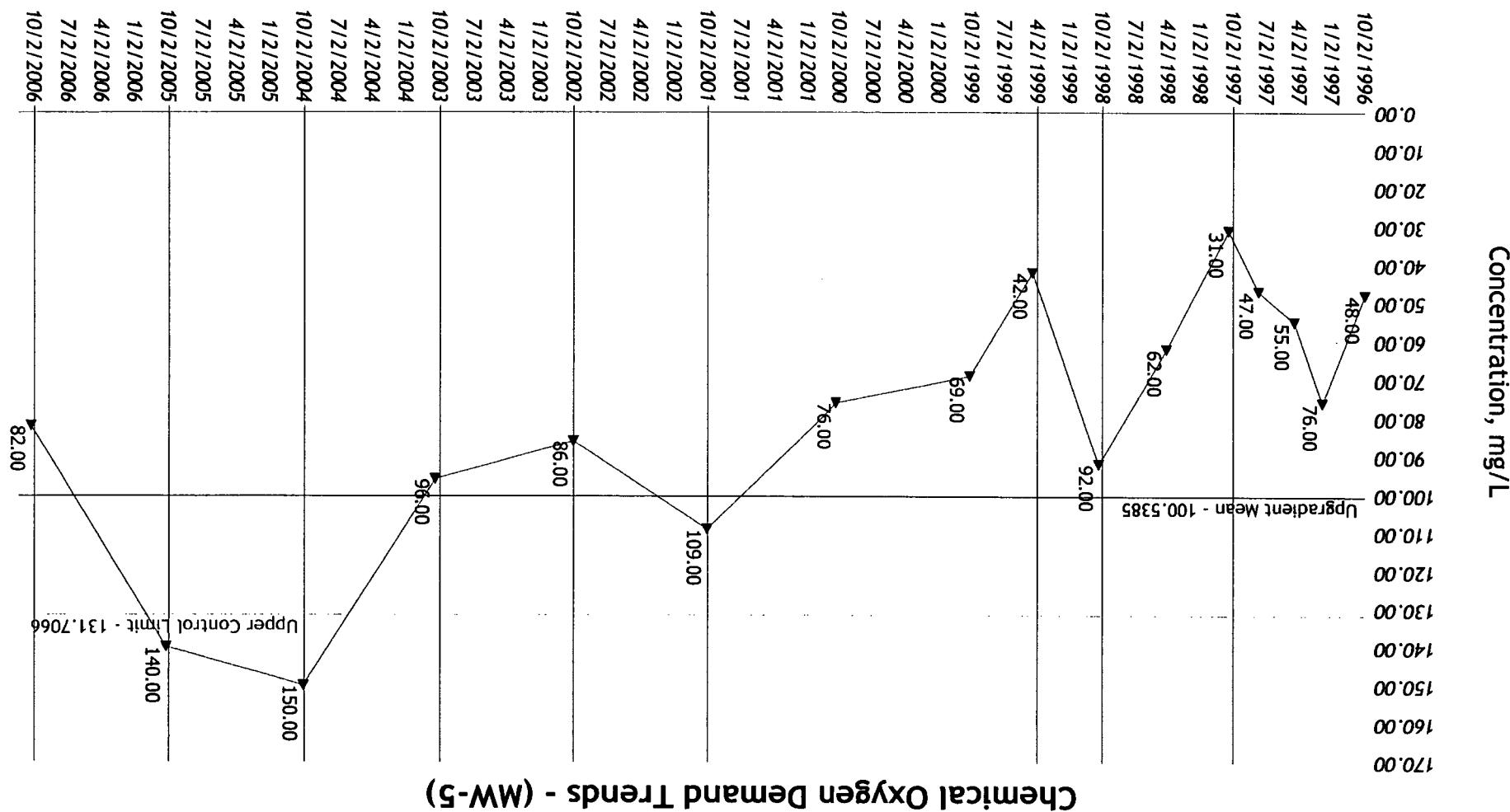
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## Chemical Oxygen Demand

## Carter Lake Construction and Demolition Landfill

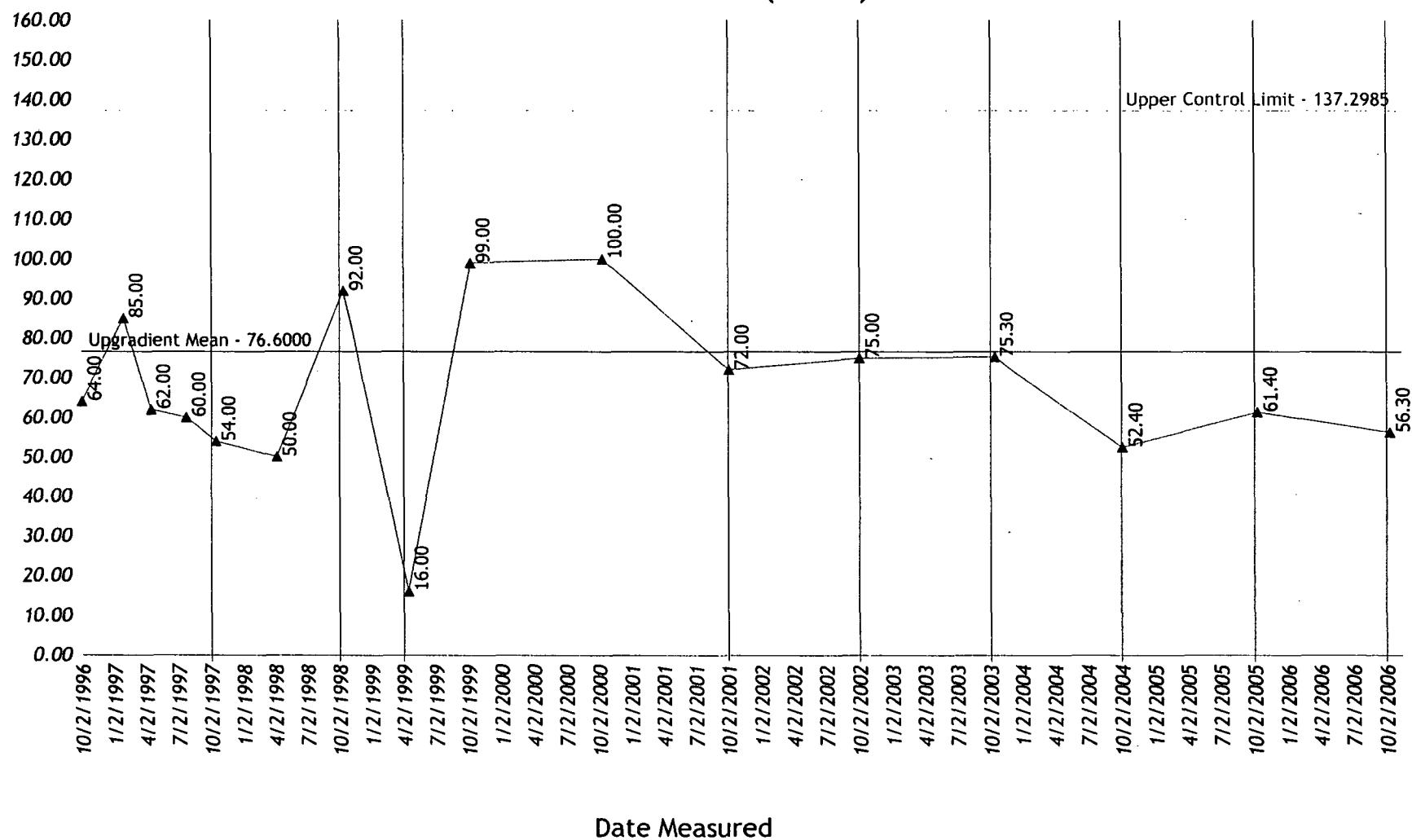
06101  
11/13/2006 1:04:59 PM

20



Concentration, mg/L

### Chloride Trends - (MW-5)



21

**Chloride**  
**Carter Lake Construction and Demolition Landfill**  
78-SDP-02-80

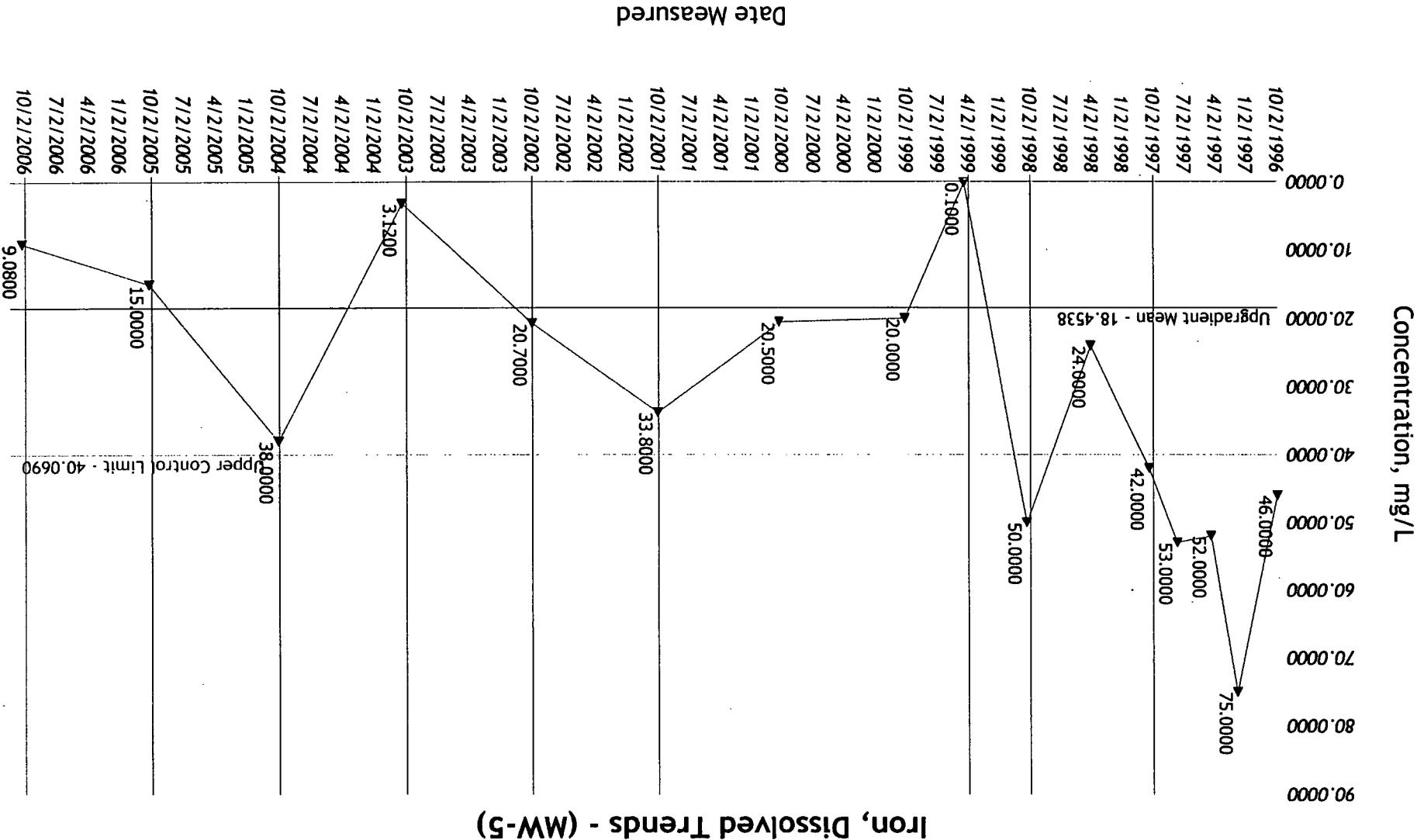
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22

78-SDP-02-80

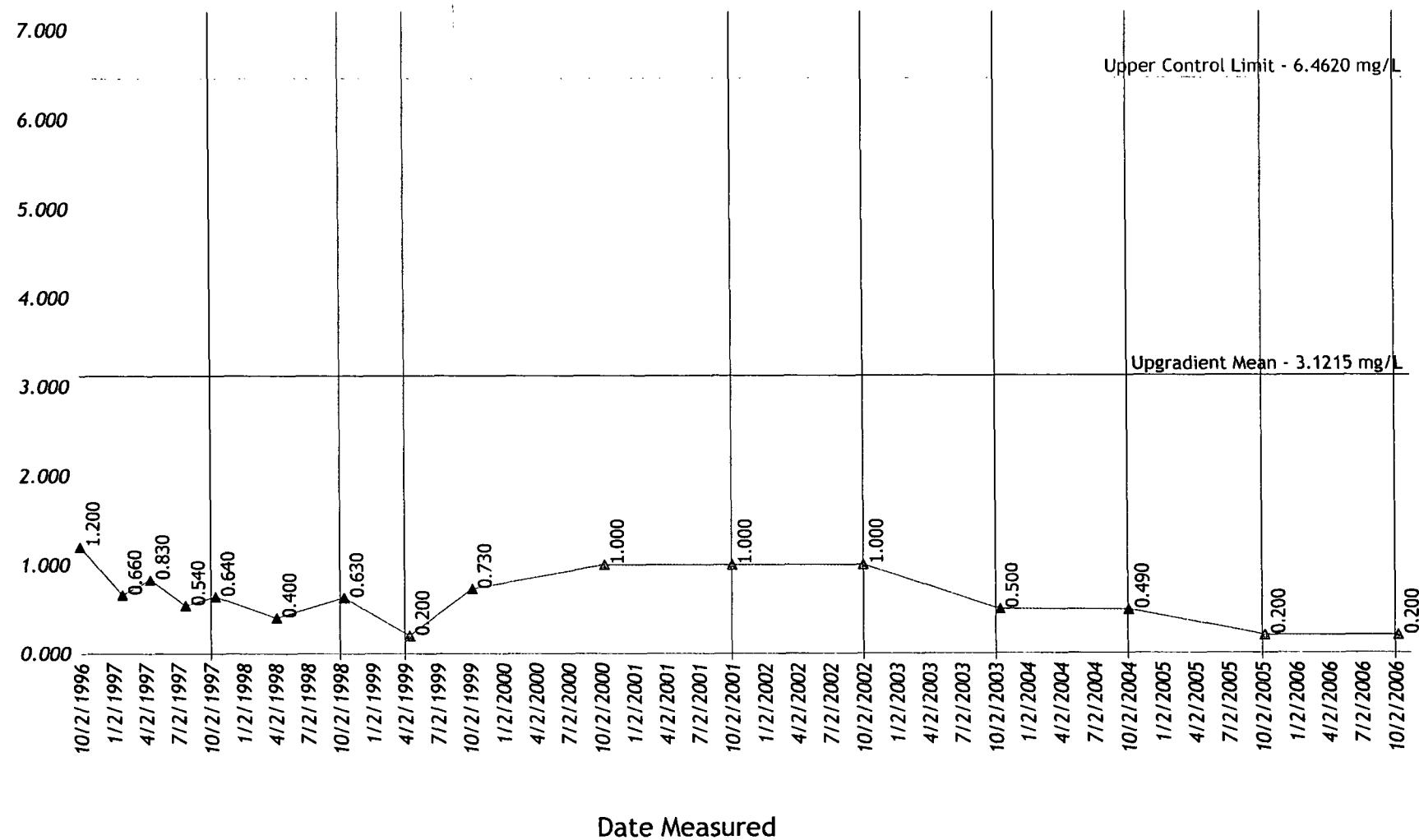
## Iron, Dissolved

## Carter Lake Construction and Demolition Landfill

06101  
11/13/2006 1:04:59 PM

Concentration, mg/L

### Nitrogen, Ammonia Trends - (MW-5)



06101

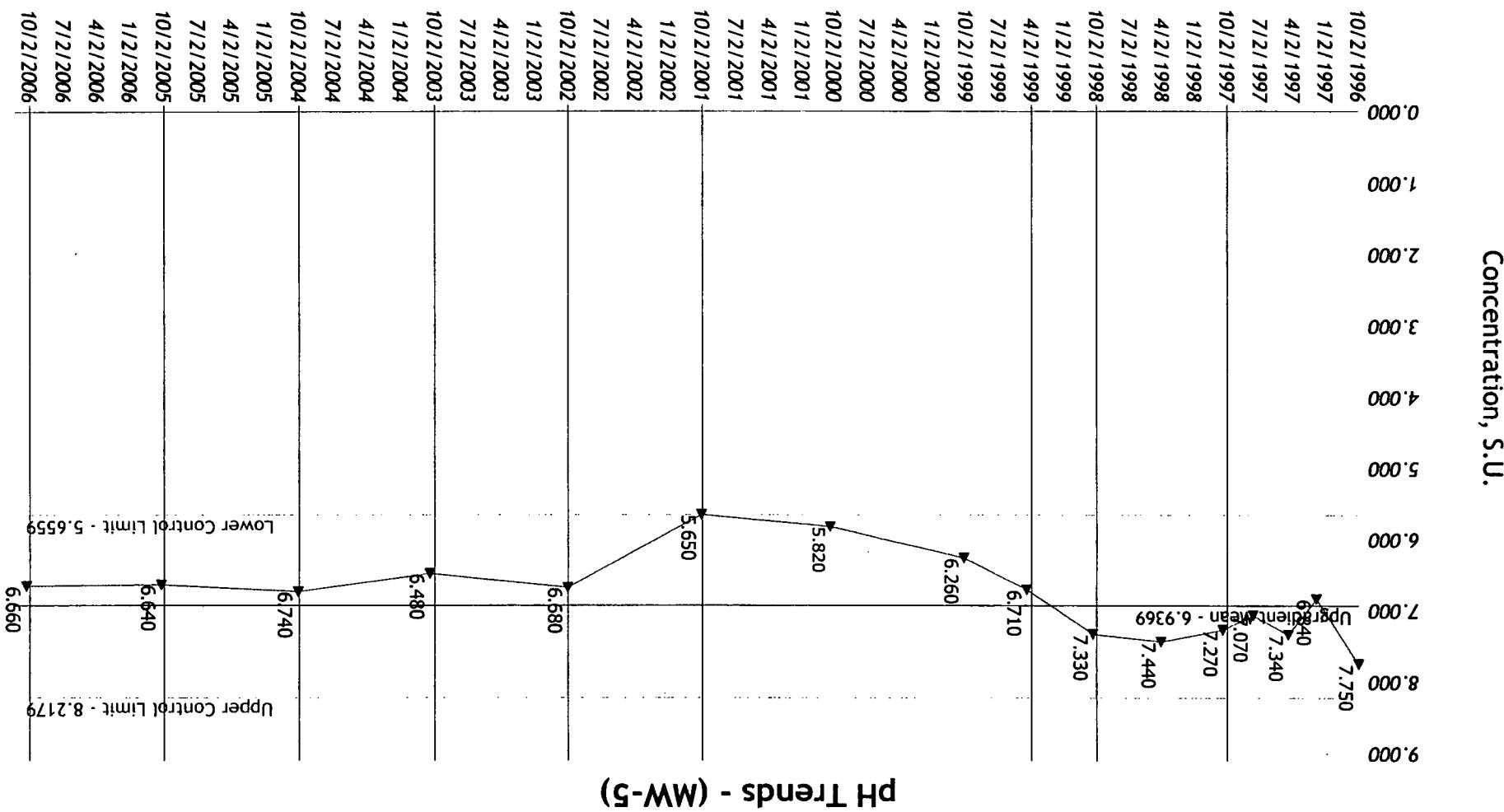
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## Carter Lake Construction and Demolition Landfill

24

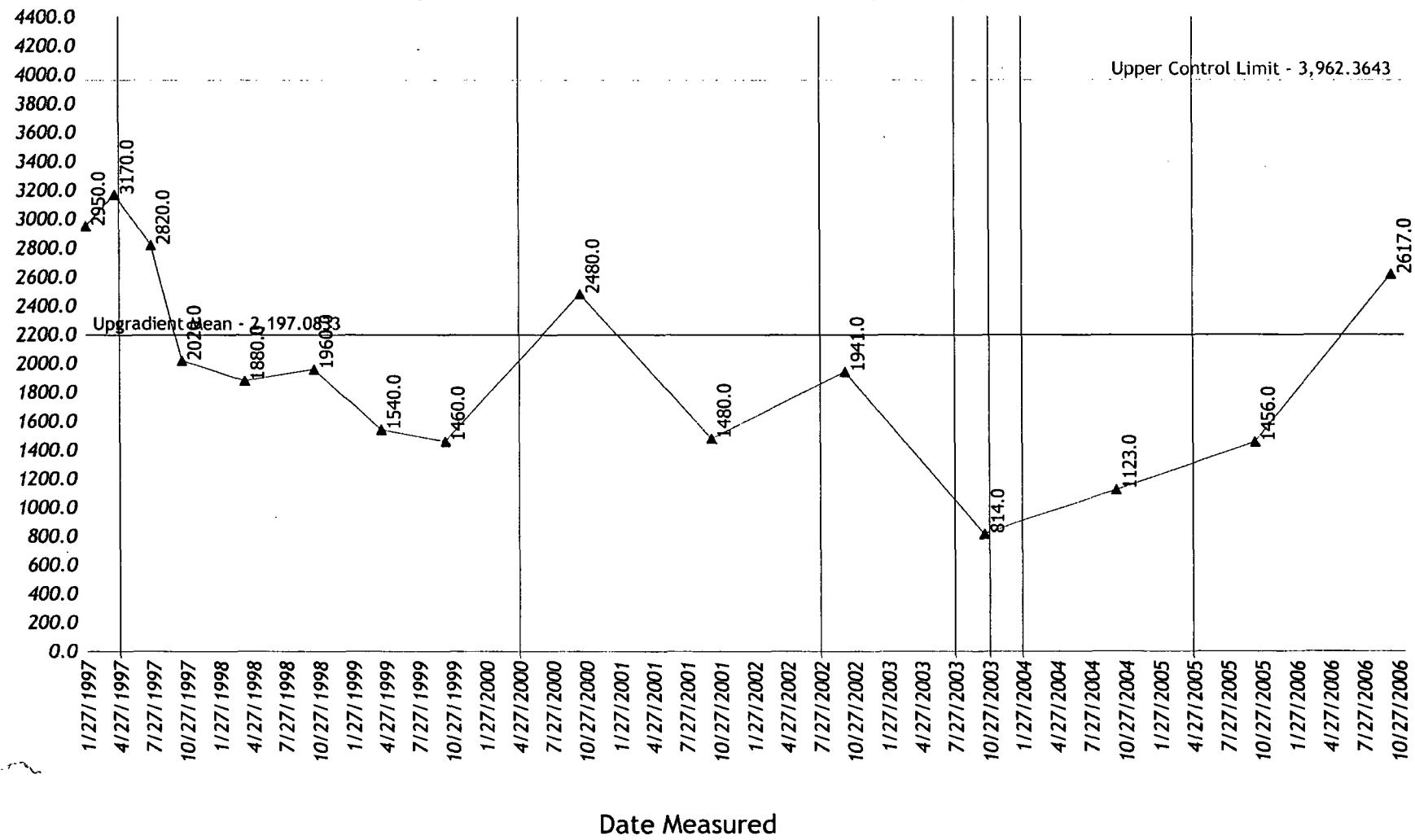
PH

Date Measured



### Concentration, umhos/cm

### Specific Conductance Trends - (MW-5)



25

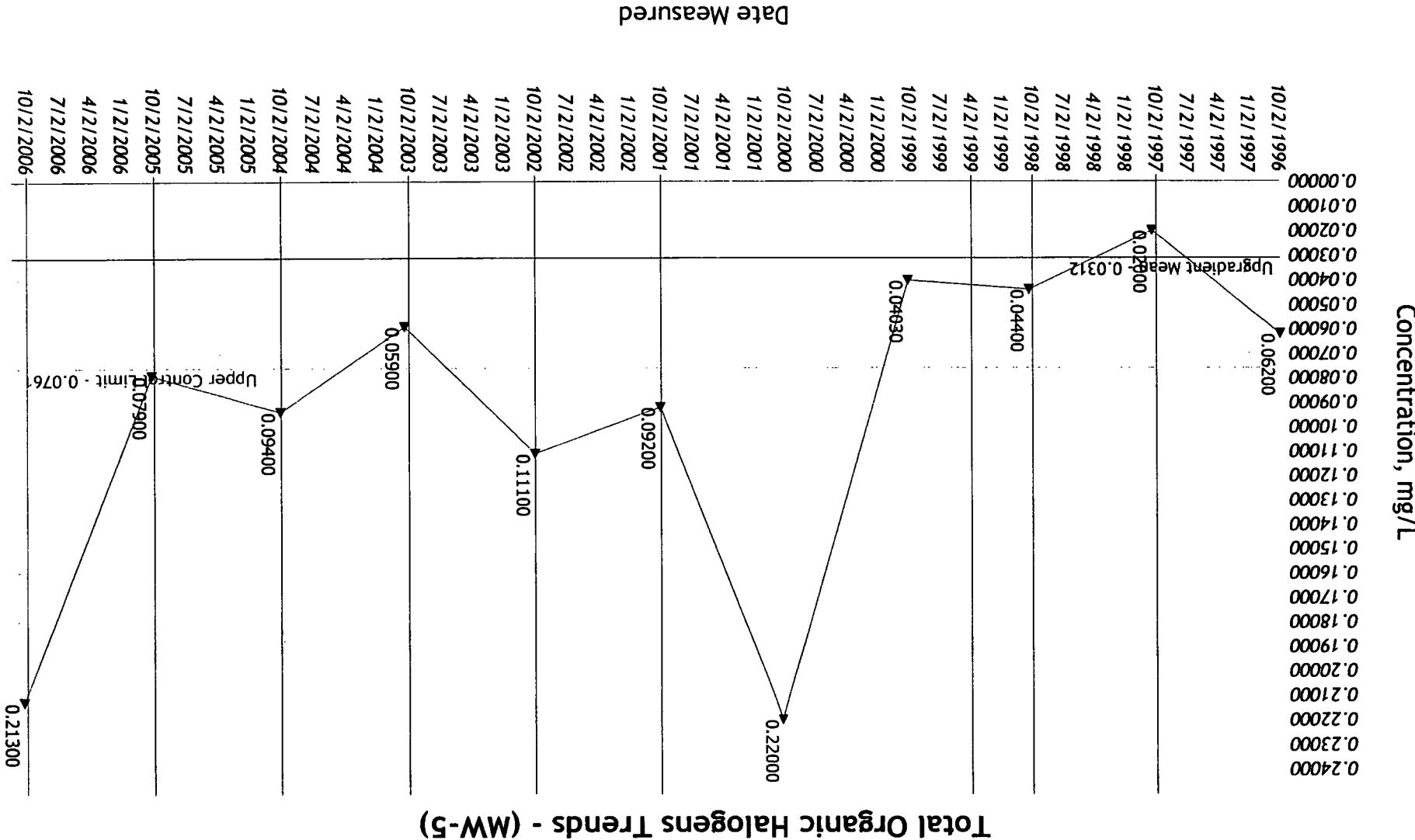
**Specific Conductance**  
**Carter Lake Construction and Demolition Landfill**  
78-SDP-02-80

06101  
11/13/2006 1:04:59 PM

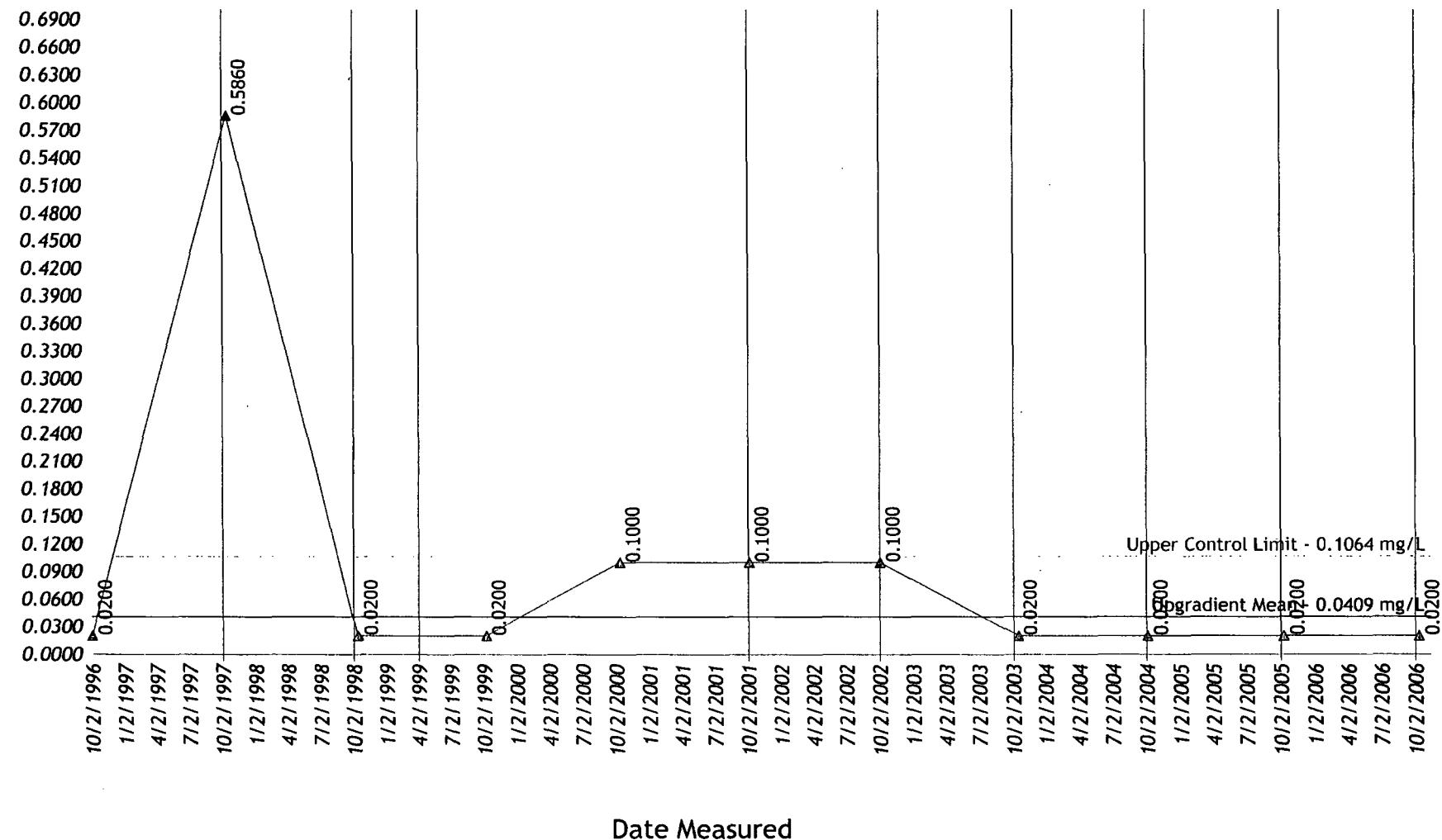
## Total Organic Halogens

## Carter Lake Construction and Demolition Landfill

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Concentration, mg/L



27

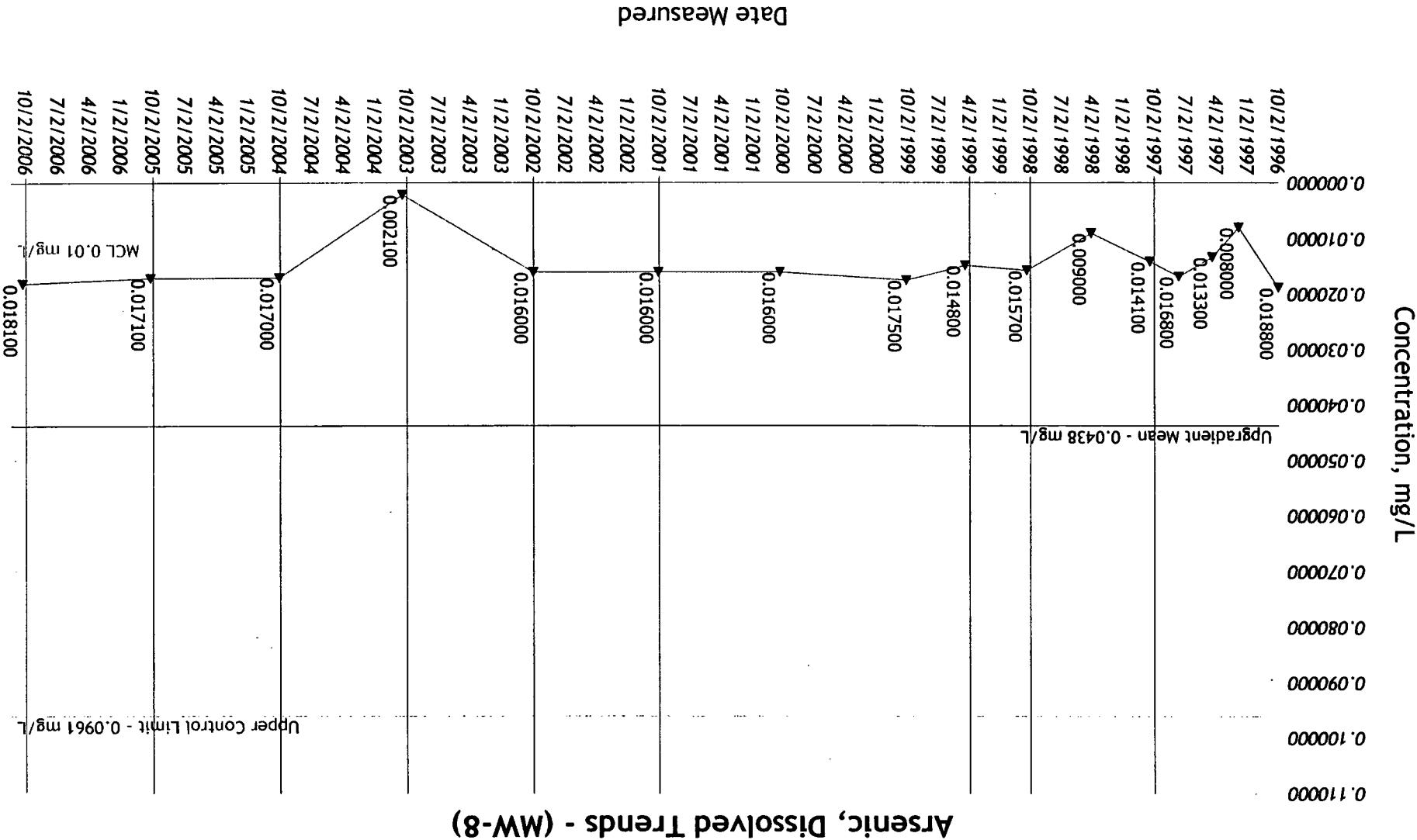
**Total Phenols**  
**Carter Lake Construction and Demolition Landfill**  
78-SDP-02-80

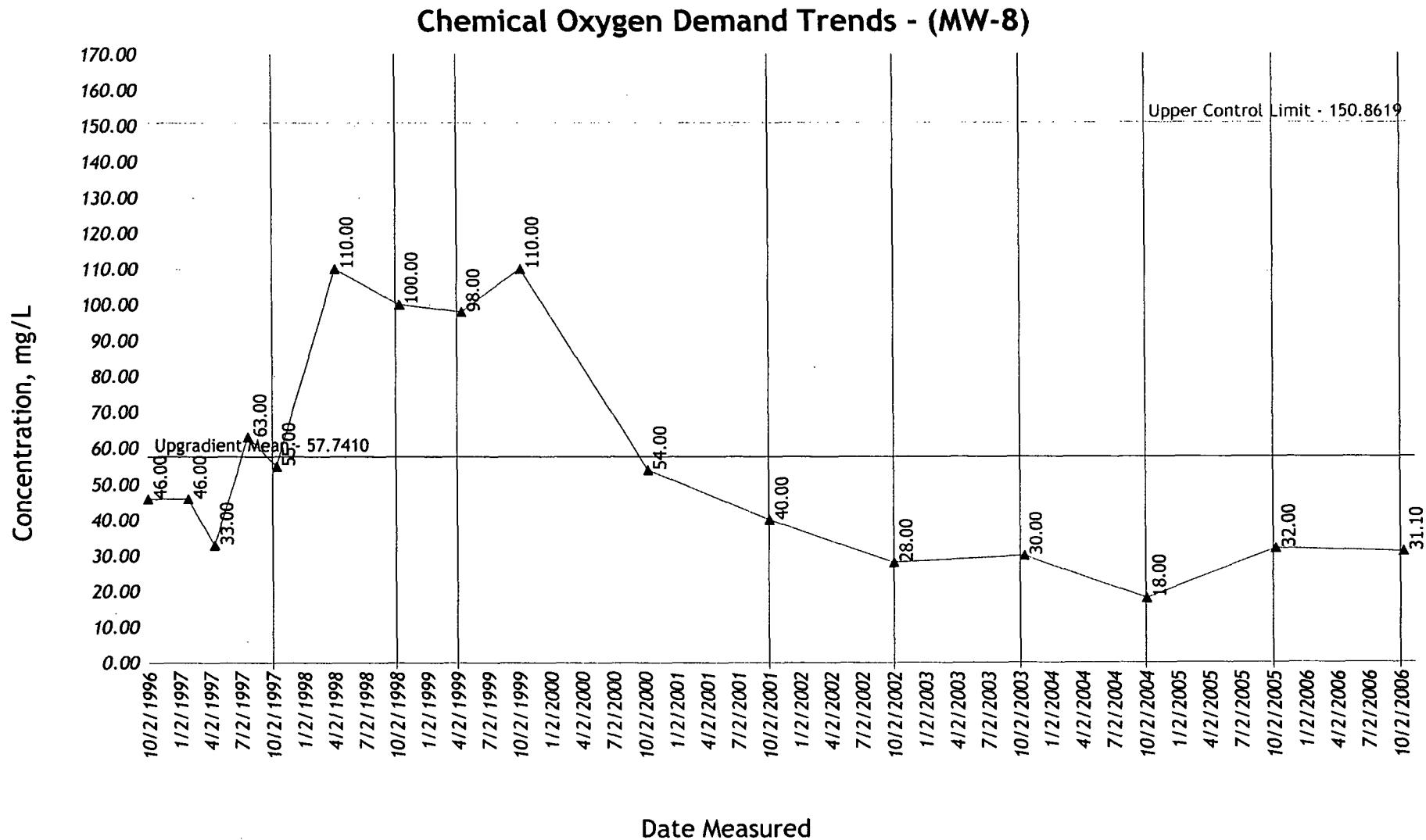
06101  
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## Arsenic, Dissolved

## Carter Lake Construction and Demolition Landfill

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11/13/2006 1:05:00 PM





29

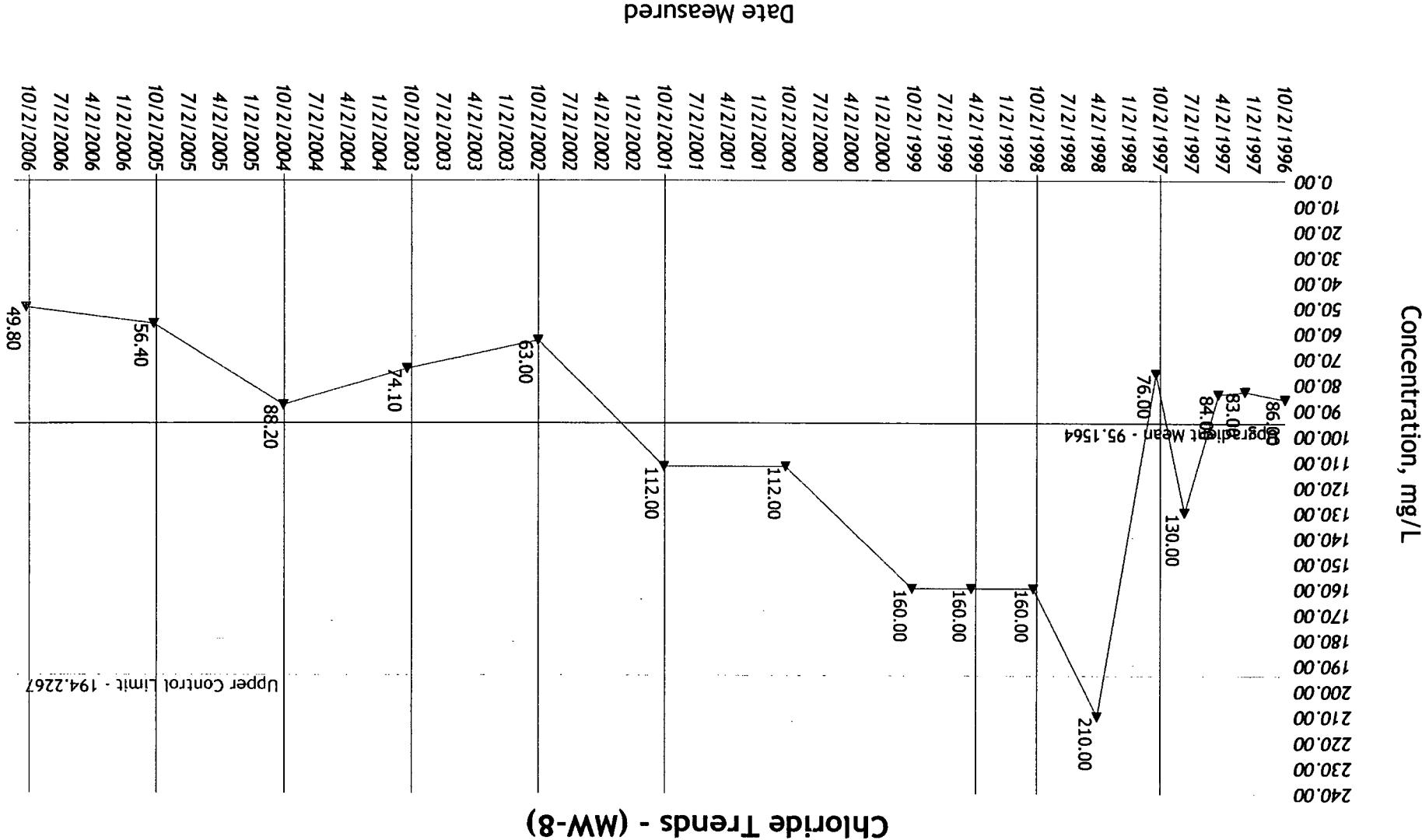
**Chemical Oxygen Demand  
Carter Lake Construction and Demolition Landfill  
78-SDP-02-80**

06101  
11/13/2006 1:05:00 PM

30

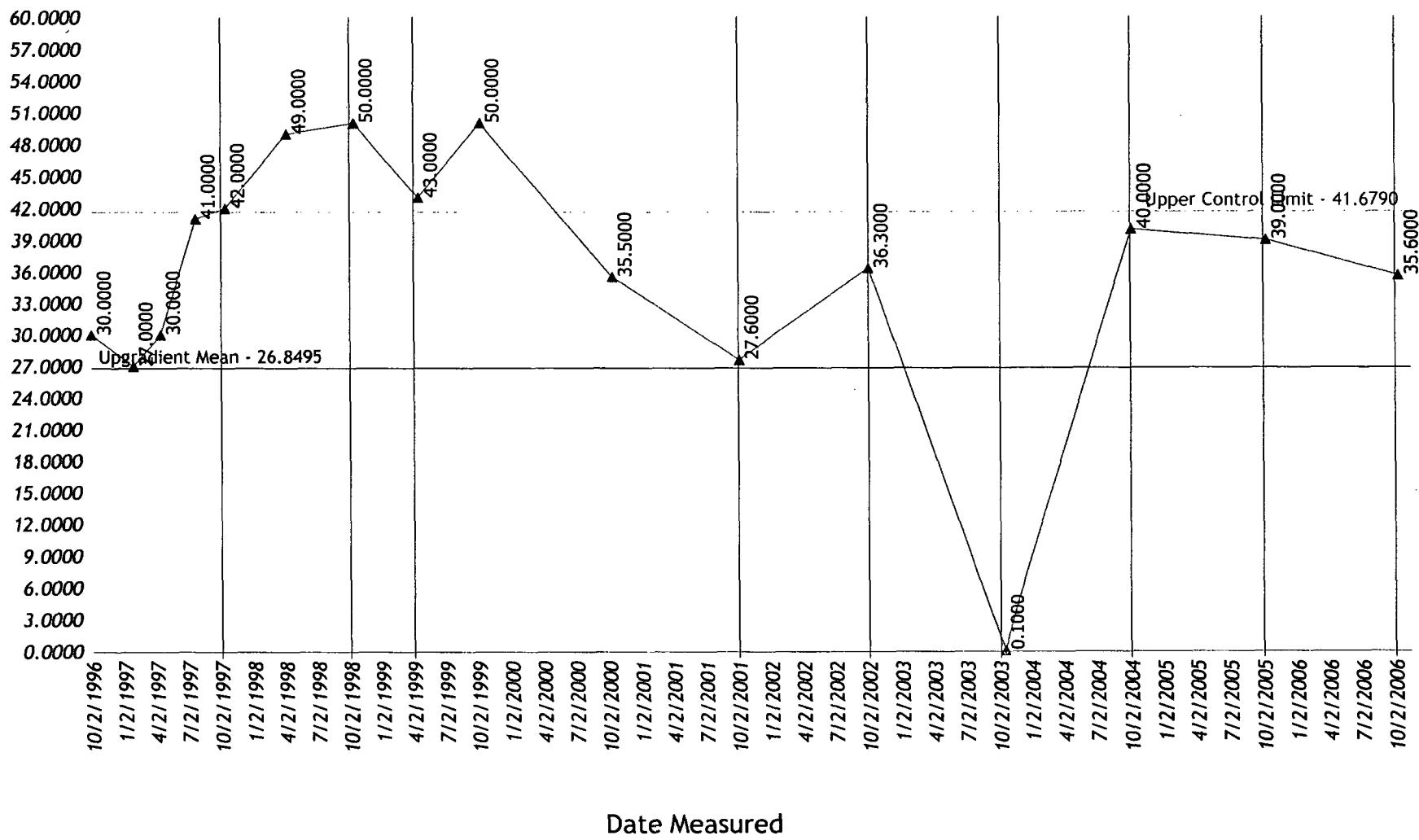
78-SDP-02-80  
 Carter Lake Construction and Demolition Landfill  
 Chloride

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Concentration, mg/L

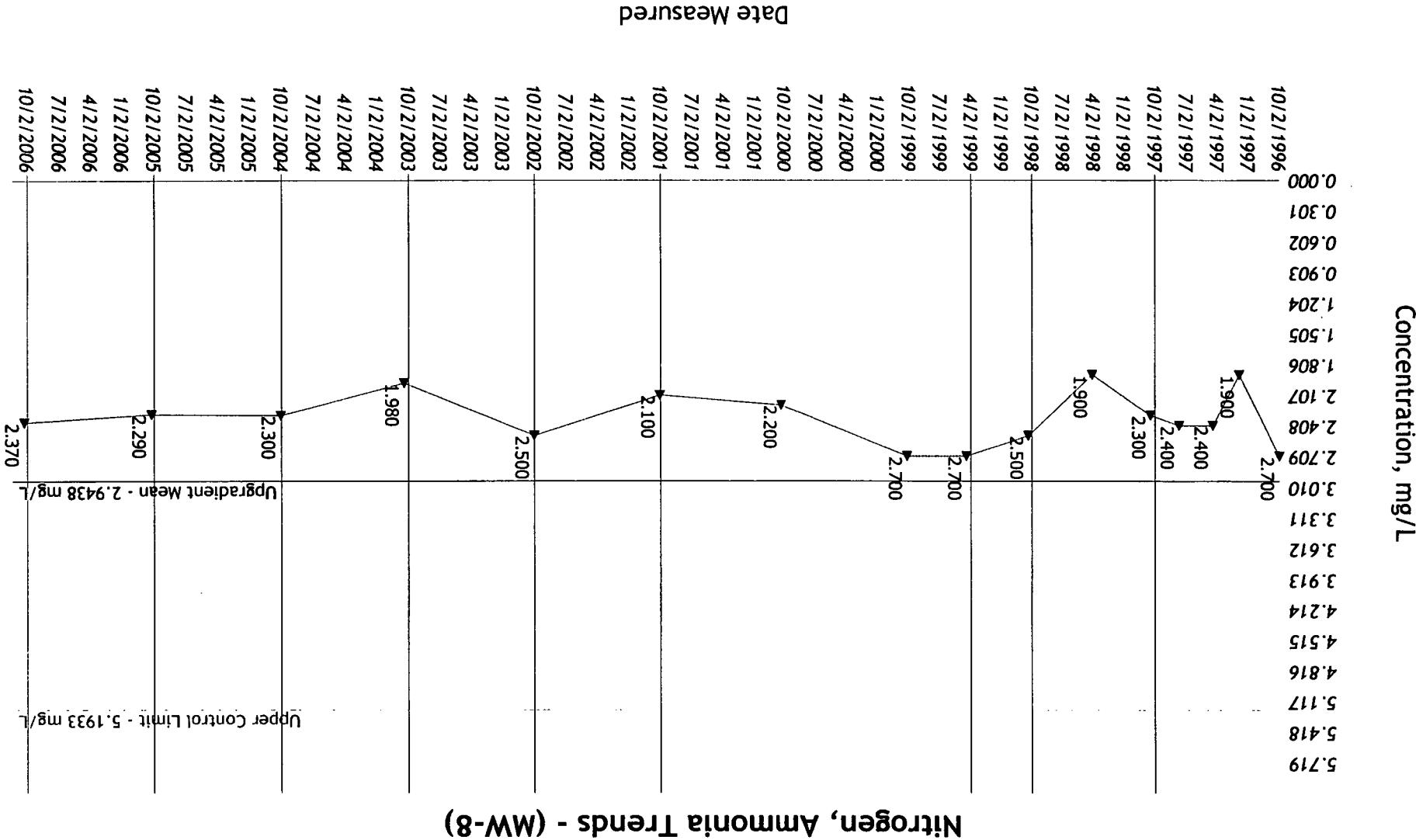
### Iron, Dissolved Trends - (MW-8)



31

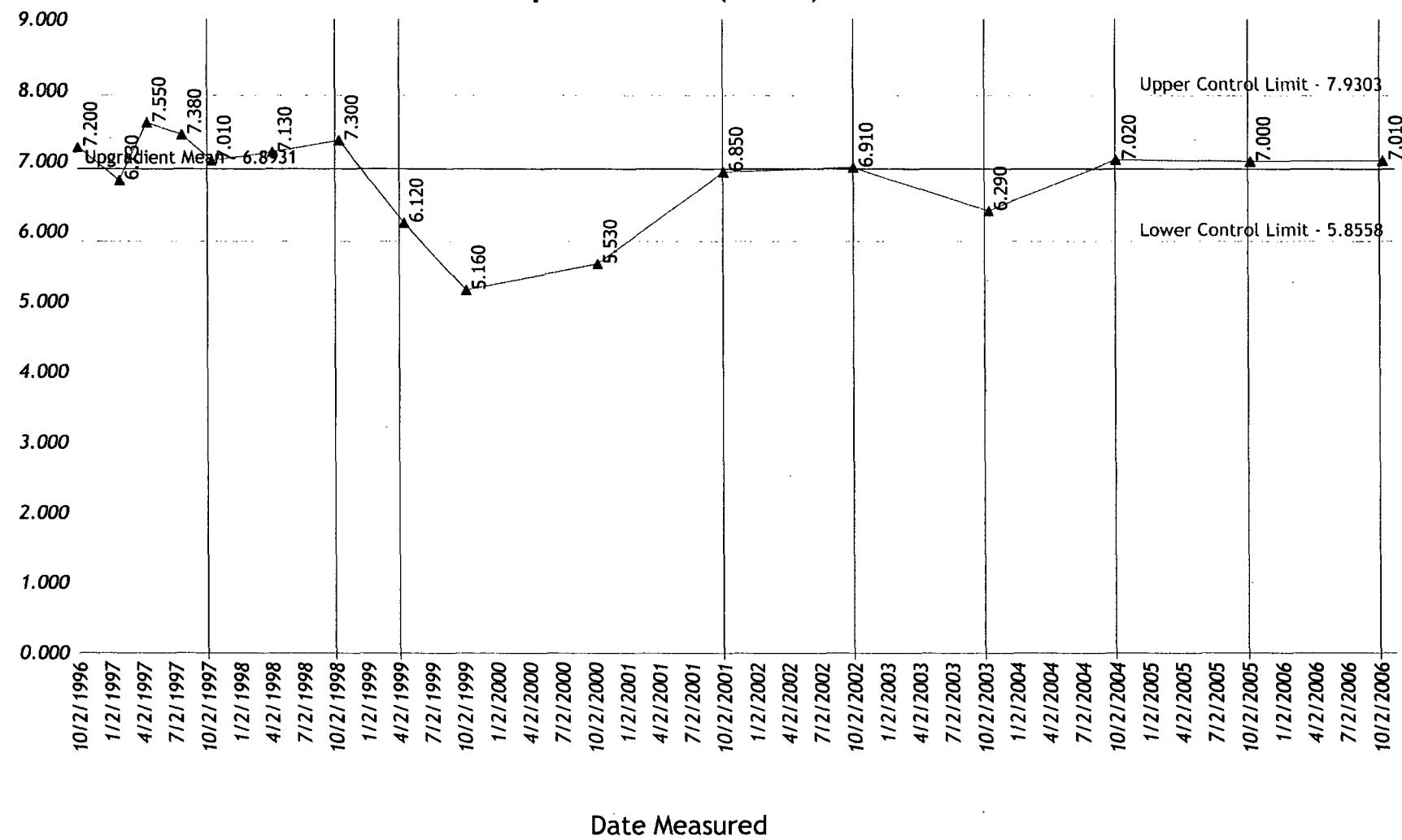
**Iron, Dissolved**  
**Carter Lake Construction and Demolition Landfill**  
78-SDP-02-80

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Concentration, S.U.

pH Trends - (MW-8)



33

pH

Carter Lake Construction and Demolition Landfill  
78-SDP-02-80

06101

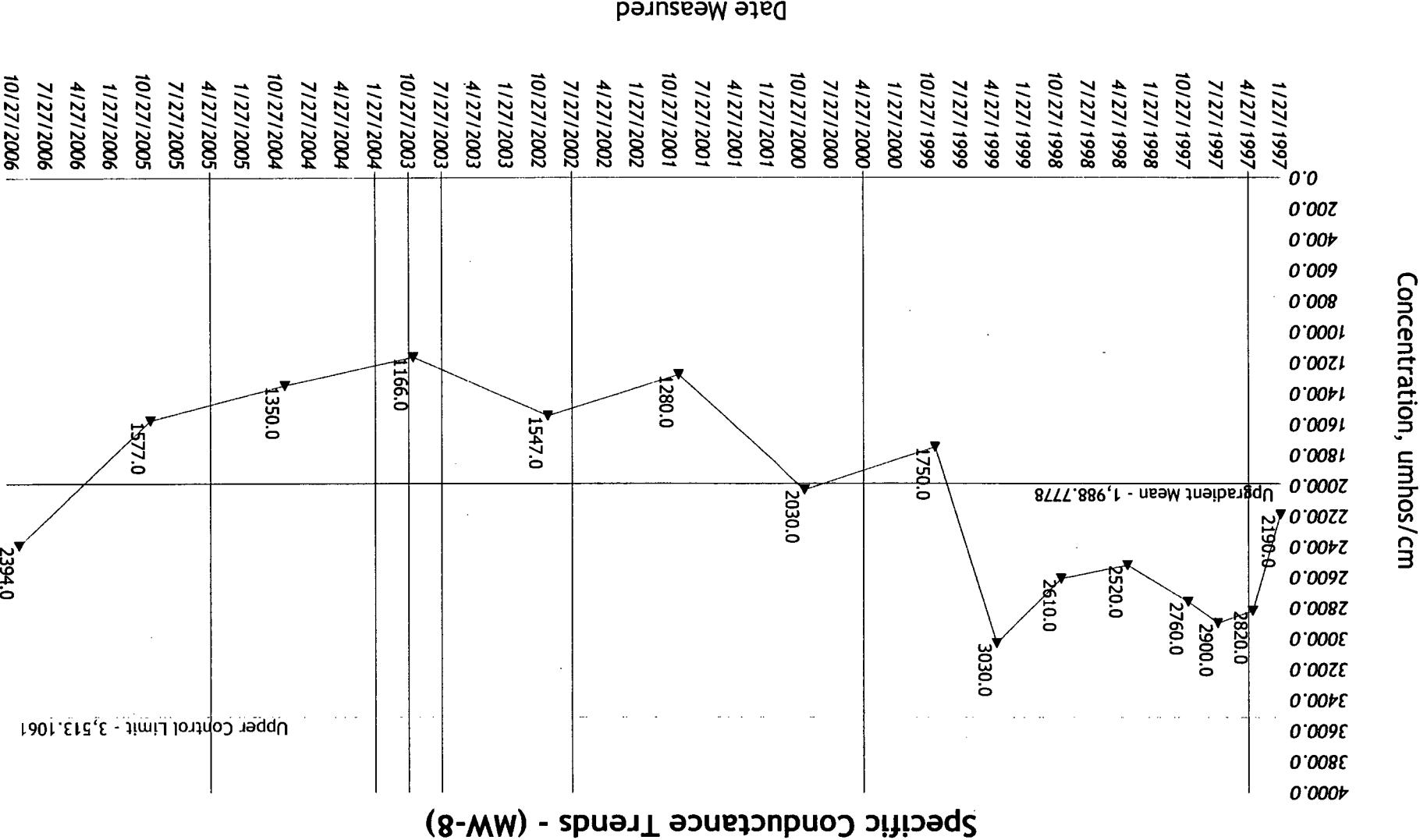
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## Specific Conductance

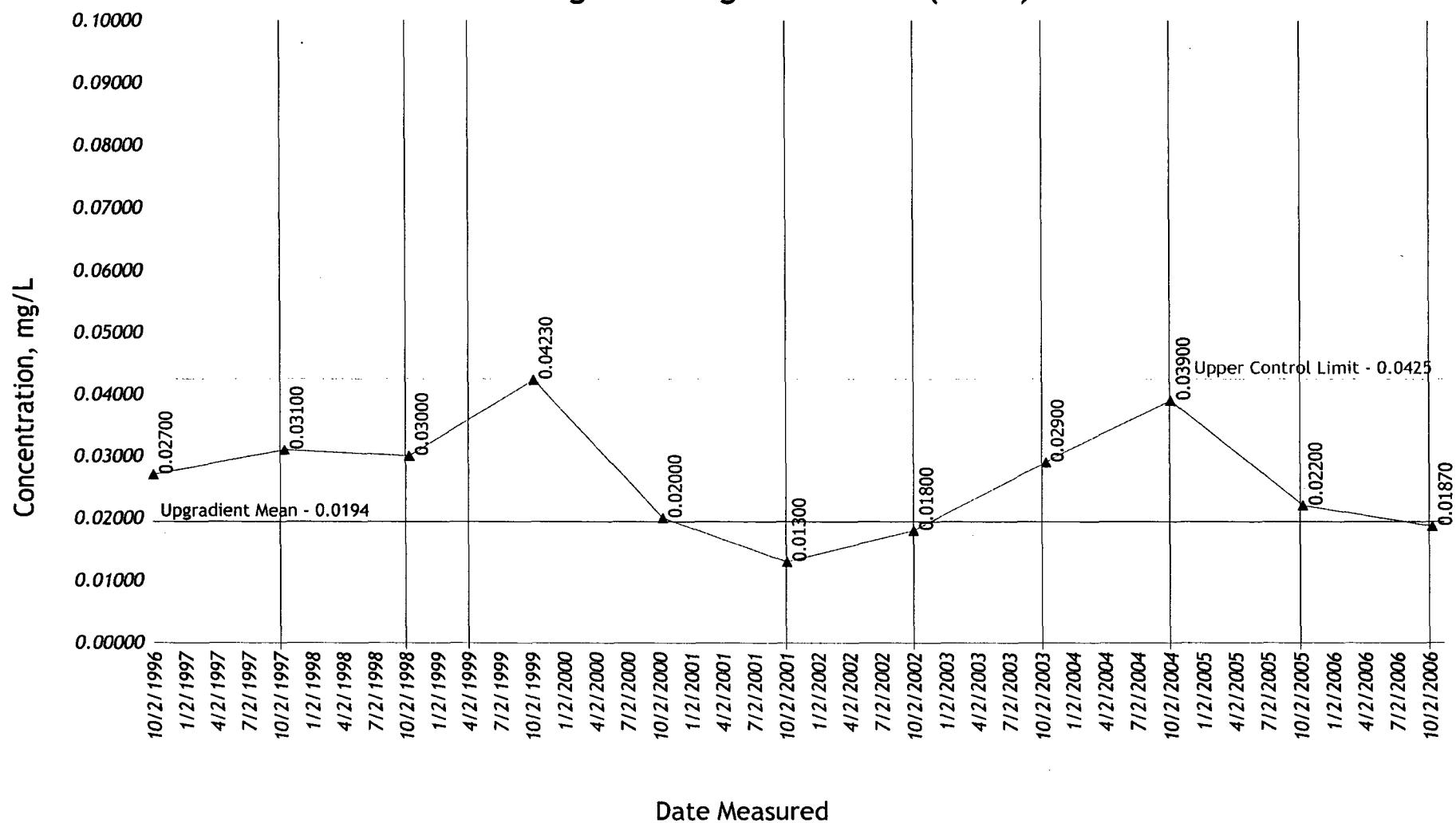
## Carter Lake Construction and Demolition Landfill

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### Total Organic Halogens Trends - (MW-8)



35

**Total Organic Halogens**  
**Carter Lake Construction and Demolition Landfill**  
78-SDP-02-80

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## Carter Lake Construction and Demolition Landfill

## Total Phenols

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